Consulting Engineer

Photo by Fabian Bachrach

August 1961

JOHN H. ROSS, Toronto consulting engineer and president of the Association of Consulting Engineers of Canada, decided after he graduated from college that he would get ten years' experience and then become a consulting engineer. Ten years, two weeks, and twelve jobs later, he became Toronto's fourth engineer in private practice. "My only regret is that I was unable to cram twenty jobs into that period," Ross mused.

Continued on page 10

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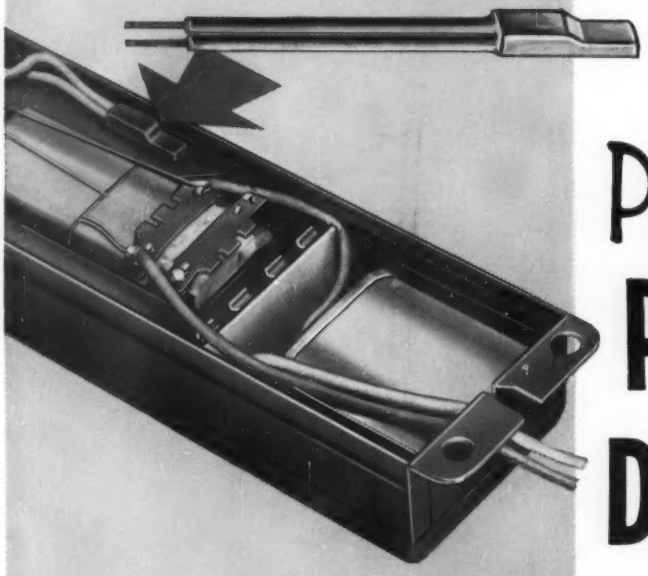

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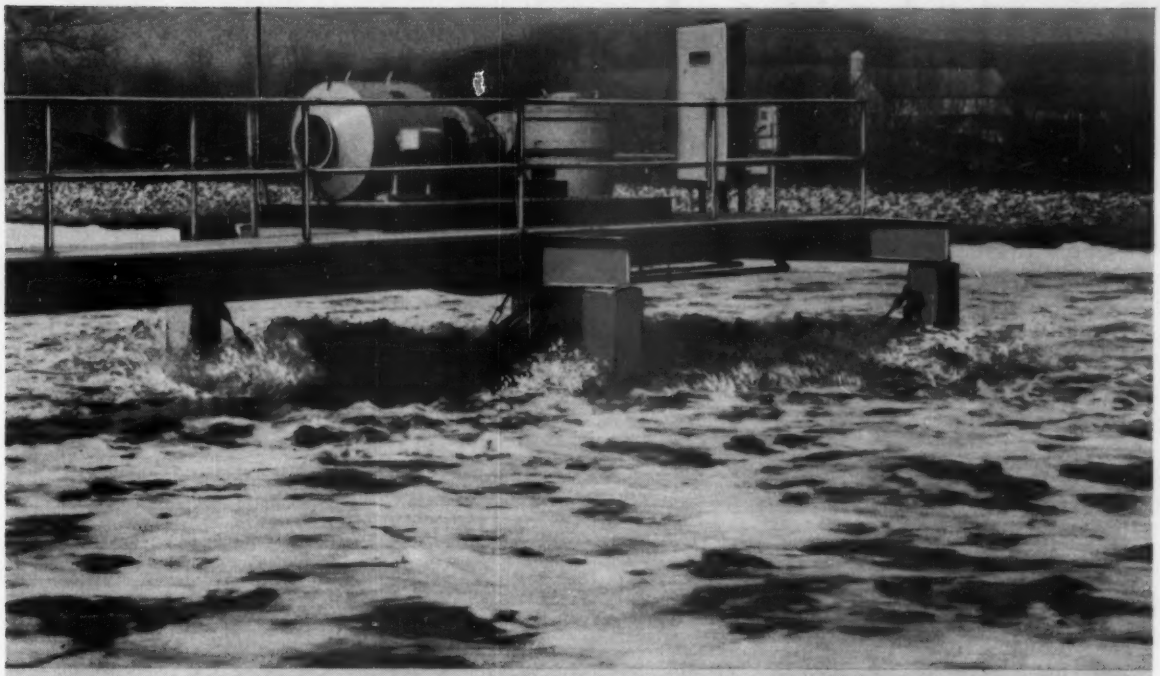

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Underwater photograph of "VORTAIR" aerator in operation.

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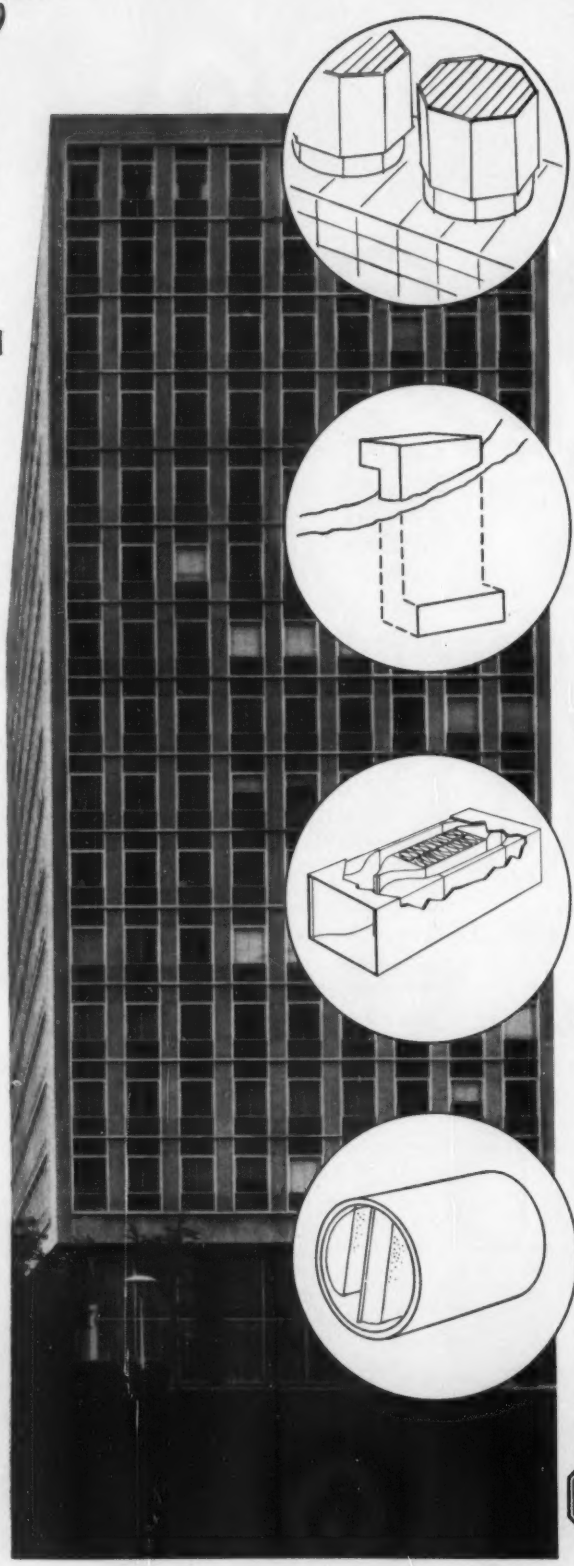

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ARTICLES

84 Engineers as Executives
R. E. Moir
88 London's Original Crystal Palace
F. C. Livingstone
92 Grain Elevator Design
George Levin
99 Engineering Productivity
John Girand
102 An Analysis of Structural Trends
Harold Woodward
106 Garbage Can Burn Clean
William McGrath
113 Computerizing Foundation Design
Eli Czerniak and Thomas Lazear

BRIEFS

56 FIDIC General Assembly Meeting
64 Mechanical-Electrical Fees
75 Institute for Consulting Engineers
125 Canadian Consultants' Vancouver Meeting
131 The Planners in Jersey

DEPARTMENTS

Cover: Personality — John H. Ross
18 From the Editor's Tranquil Tower
20 Readers' Comment
30 The Legal Aspect
39 The Word From Washington
48 The High Spots
77 Presenting Our Authors
82 Readers' Guide
141 Heard Around Headquarters
154 "Quote . . . End Quote"
165 The New Projects
173 Books
176 Men and Firms
182 Consulting Engineers' Calendar
184 Advertisers' Index

The Engineering Index Service in Public Libraries lists articles from Consulting Engineer

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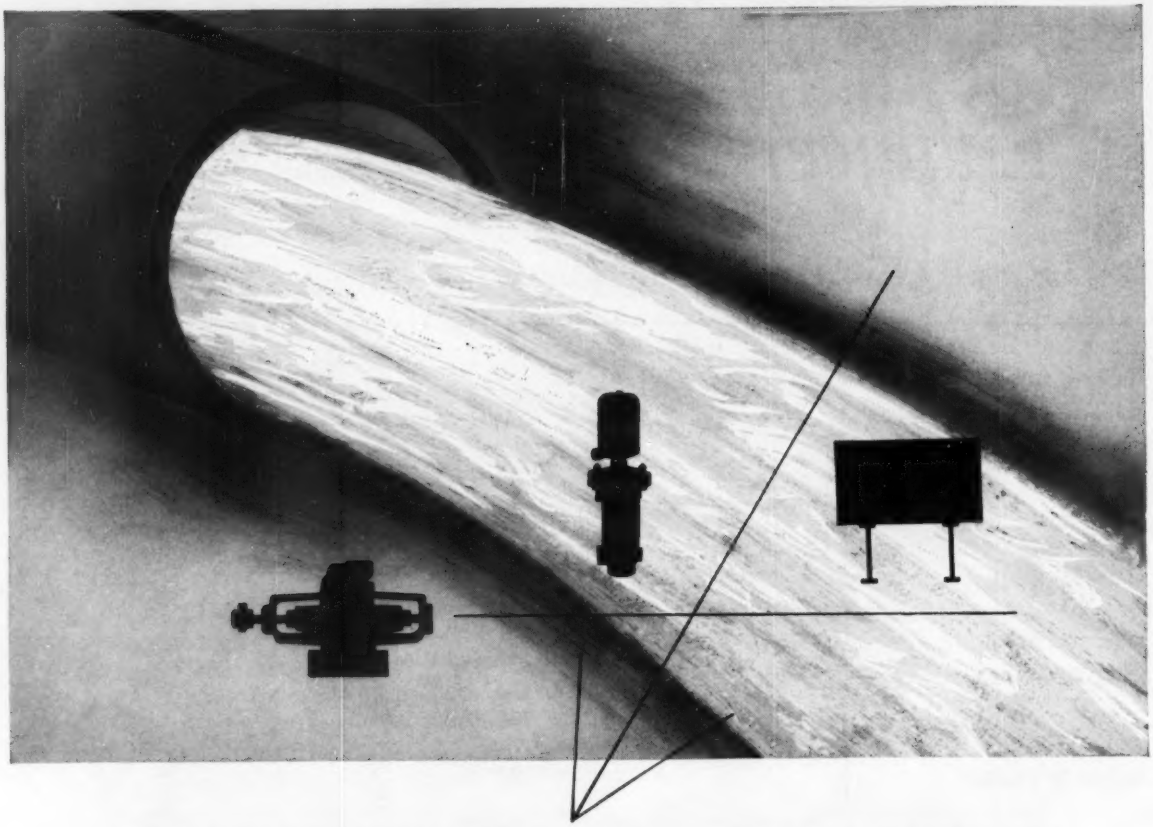

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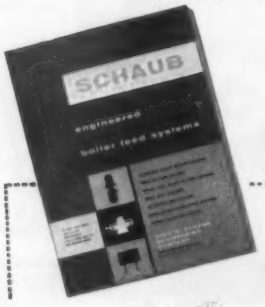

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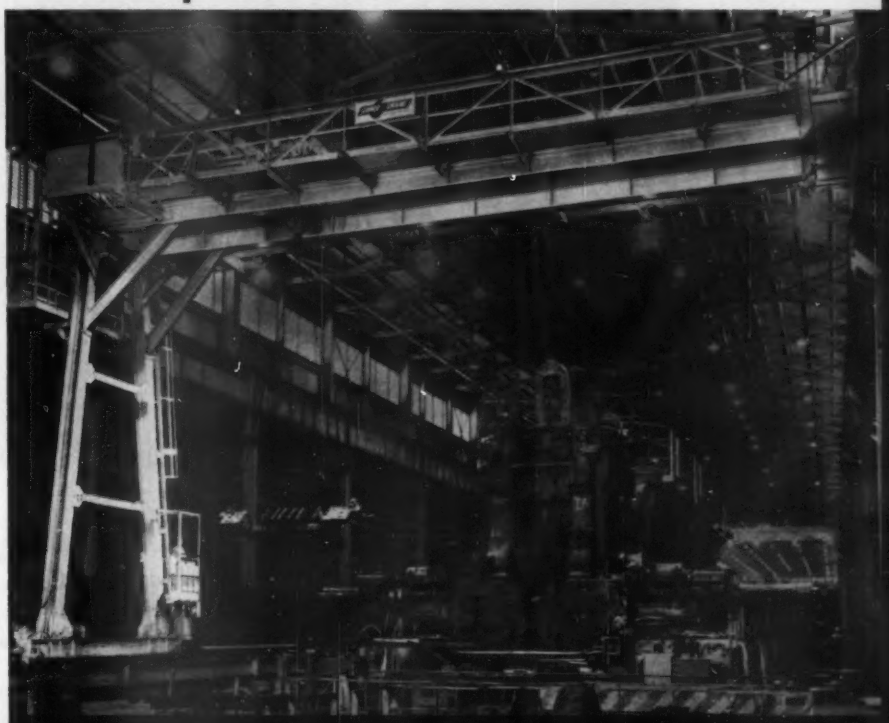

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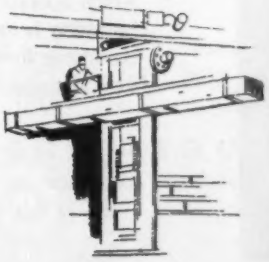

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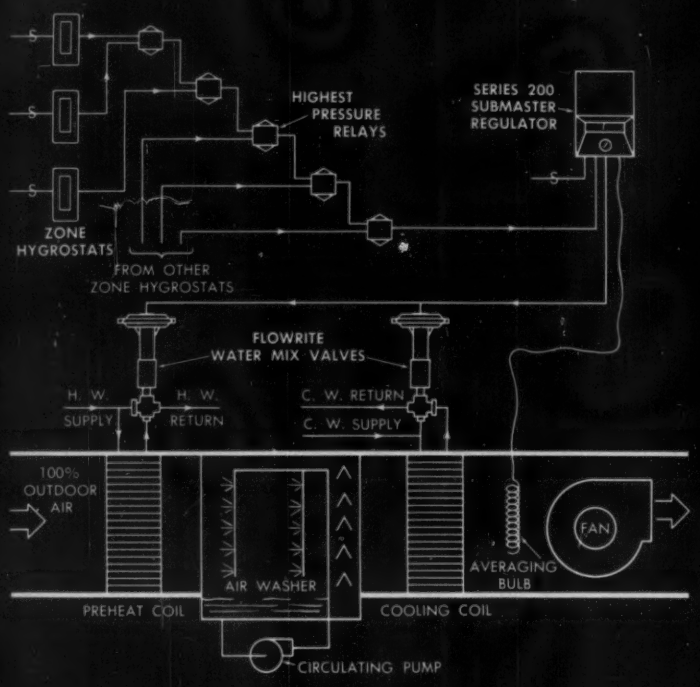
HOW TO GET OUT OF A SPACE SQUEEZE



At Holy Cross — where they automated "just about everything but patient care" — space was even more of a factor than with most hospitals. Money is always a factor.

Consulting engineer, John F. Reardon, was in the middle of the "squeeze", but he had a number of very practical ideas that brought him out with room to spare. One was on humidity control. His practicality in this instance was a central air washer rather than individual zone humidifiers. In terms of space and cost savings, this totaled up in the elimination of water pans and drains, complex piping, steam coils, control valves and numerous access doors.

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Award-winning Holy Cross Hospital is located in picturesque San Fernando Valley, California

a Series 200 Submaster which in turn operates the valves on either the pre-heat or cooling coil as required. The air washer, located between these coils, operates continuously without addition of heating or cooling to the spray water.

Another important innovation at Holy Cross is private facilities for individual rooms. The shower in each is protected by a Powers Hydroguard Thermostatic Control which prevents accidental scalding and fluctuations in water temperature.

For detailed information on the temperature control system and/or shower control system at Holy Cross request layout drawings and full description. Also ask for reprints describing Powers Control Systems in other institutions.

Heading up the planning staff were (left to right): Consultant, Gordon A. Friesen; Consulting Engineer, John F. Reardon; Architect, Gene Verge; and Administrator For Holy Cross Sisters, Sister Olivia Marie.

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CONTROL SYSTEMS SINCE 1891

JOHN H. ROSS

– Starts on front cover

Routine is something Ross has managed to keep out of both his personal and business life. For relaxation, he plays an electric organ at his home with window-shaking fervor. ("In the winter the neighbors can't hear it. In the summer, they send over requests.")

A Practical Background

A fourth generation Canadian of Scotch-Irish ancestry, Ross was born in Orillia, Ontario, near Lake Couchiching. "My father was a self-taught boat builder. The business has been in the family for 70 years, and my brother is continuing it."

At the age of eight, Ross had his first boat. He liked to work on the boat motors, while his brother always was more interested in the manufacturing end of the business. By the time he was in high school, Ross had developed another hobby. He built and sold radios – an enthusiasm which his parents did not share. But actually, Ross found a ready market for his product. "I could make an 8-tube set in about a week and sell it for $120 to $125. Of course, my dad's boat shop had a good supply of mahogany for the cabinets.

"After high school, I went to technical school and covered a four-year electrical course in one year, working with an electrician during this period. I think the experience was invaluable. There is more to engineering than theory, and I had an early introduction to the practical side."

One of the practical lessons Ross learned was during the wiring of a large church organ. "I got the shock of my life. I was standing on the motor tightening fuse clips." He later took lessons on this shocking instrument. Next, Ross enrolled in Queens University, Kingston, where he worked his way through the mechanical engineering course. In the summer, Ross worked for his father.

Ross thinks all engineers should take five-year courses in order to broaden their background in the humanities. "I was fortunate. In a small college, the students are much closer to the teachers, and learning isn't limited to classroom notes. We had some quite interesting professors. For instance, our English professor was a writer in his spare time, and he used to spend the summers with construction crews gathering data."

In addition to the required courses, Ross took all the surveying and astronomy courses he could get. Both have proved useful – the latter in navigating the boat he still keeps on Lake Couchiching.

A Variety of Jobs

After graduation, Ross wasted no time in starting on a whirlwind of jobs. "I always told the employer that I was seeking experience with another goal in mind, and did not plan to stay more than a year at most. All of the firms were very cooperative, helping me get a well rounded picture of their operations."

In Canada, Ross worked for a manufacturer of mining machinery. "I learned about this business as a junior apprentice making 16 cents an hour."

Next he became a draftsman for Kodak, which was building a high-pressure steam turbine generating station at its Toronto plan.

From there, Ross went to National Carbon, a subsidiary of Union Carbide, in Toronto, where he was assistant to the works engineer for a year. National Carbon was in the process of altering a broadcasting station – later leased to the government – and Ross did some of the acoustical planning. "I was half engineer, half draftsman."

Offered a chance to go to Argentina for another branch of Union Carbide, Ross moved his wedding up two months so he could take his wife with him. "I married a girl from my home town, but she was not 'the girl next door.' As I recall, it was a long walk."

In Argentina, Ross worked with a group that was given a three-story, 150-ft square building to turn into a battery manufacturing plant. The equipment was imported from Cleveland. "While I was there I learned to speak Spanish, but later learned I spoke it with a French accent. I was studying it with a French machinist at the plant."

The Argentine building looked good compared to Ross' next project. John Inglis Co. Ltd., which manufactured boilers, was asked by the government to produce machine guns. "The first time I saw that building, pigeons could fly in the roof and the floors were full of holes. Within one and one-half years, we were in full production. At this point, the problem was equipment, and the first machine gun barrels were made on World War I rifling machines."

A member of the Engineer Corps reserve, Ross tried to sign for active duty during this period, took his physical, and was never called. He learned 10 years later that his employer made representations to have him deferred because of the nature of his work.

Becoming a Consultant

During the early years of the war, Ross was asked to go to Montreal, to Defense Industries Ltd. They proposed to build a plant for manufacturing nitroglycerine near Nobel, in Ontario. On this job, the group had seven months to build 17 buildings and turn them into a producing plant.

"My next job site was a cow pasture, near Long Branch, Ontario. Within two years, 6000 men were working where two cows were grazing on my first visit. This plant turned out rifles and machine guns."

After other short jobs, Ross decided it was time to learn something about how a consulting office was

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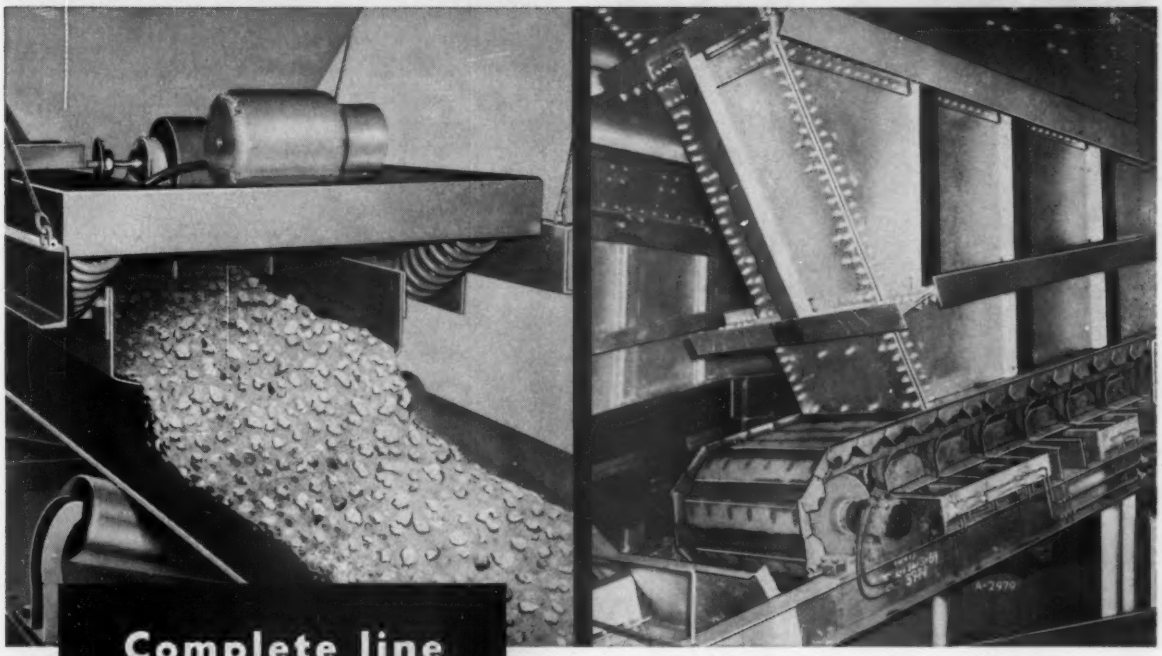

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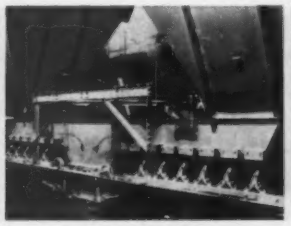

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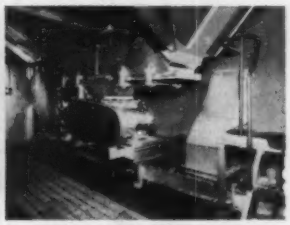

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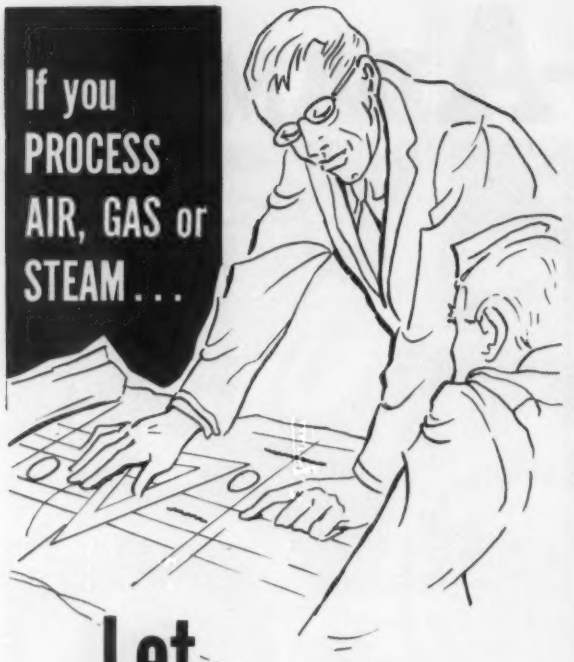
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run, but he did not want to work for anyone with whom he later might be in competition. Moving to Montreal, he got a job with G. Lorne Wiggs, doing heating and ventilating design.

"On June 1, 1945, I opened my own office in Toronto by renting desk space from an architect. The first six months were not too difficult, because everyone is willing to help a young engineer get started. I found that the second six months was another story. By then, everyone assumed I was busy, and I was pounding the streets for projects." Ross thinks that to be safe, any engineer planning to be a consultant should have enough in the bank to support himself and his family for two years – although Ross did not have to wait this long before his business was returning a profit.

Today, Ross' firm consists of L. M. Bennett, vice president (who joined the firm after graduation as a mechanical engineer in 1946), Miss M. M. Dawson, secretary-treasurer, and 15 employees including three engineers. "At one time, I hired only graduate engineers, but I soon found that we always were ahead on design work and behind schedule on drafting."

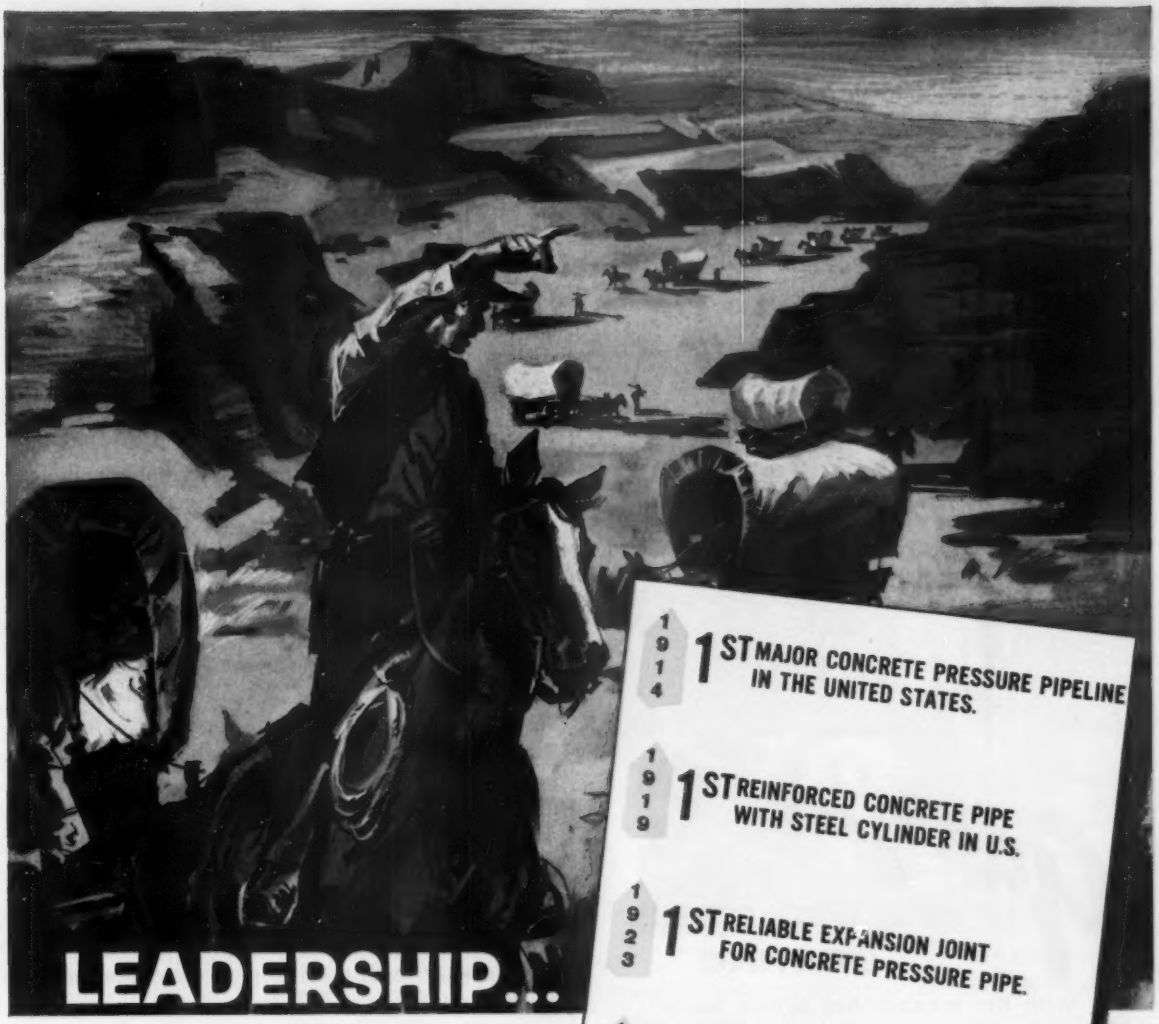
Ross, who is active in a number of professional and technical organizations, encourages his engineers to follow his example. The firm pays the dues and certain other expenses for each engineer's first organization membership. He requests that the men not all join the same groups. Also, in Ontario, technicians are registered in four grades. Ross encourages his draftsmen to advance through all four classifications.

Special-Purpose Projects

Unusual projects are quite common in Ross' firm. His first large project was the mechanical design for the Crippled Children's Hospital in Calgary for treatment and study of all children's diseases. A similar project, now under construction in Toronto, is a crippled children's center that has two swimming pools – one Olympic style and the other designed for therapy. The latter can be heated to 95 F, and the temperature can be regulated in a range of 35 degrees. The center includes a motel designed for the parents of the young patients. The motel was donated by the Toronto Rotary Club, to which Ross belongs.

Several years ago, Ross' firm handled the design on a maximum security reformatory at Millbrook, Ontario. "This reformatory was unusual in a number of ways. There are no windows in the security areas, and no bars on any windows. Instead, the architect used glass block, with flat steel bars embedded and hidden in the mortar joints of the glass brick."

To avoid the possibility of prisoners taking over the boiler room in case of riot, the heating equipment was housed outside the walls. Warehouse and garage areas were attached. Since air ducts could be used by inmates as a speaking tube, the discharge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1961 NOW— a new, NON-CYLINDER prestressed concrete pressure pipe—product of 56 years experience in the manufacture of concrete pipe, and developed through 24 years of research and 10 years of service testing in actual water works systems.

For information, write for the brochure on:

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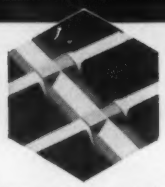
Lock Joint Pipe Co. • East Orange, N. J.

Member of The American Concrete Pipe Association and The American Concrete Pressure Pipe Association

SPECIFY

Gary



WELDED STEEL GRATING

with the hexagonal cross bars

Tested and proved in millions of square feet! Used under all conditions, for open flooring and stair treads, Gary's hexagonal cross bar design and square edge strip assure a more durable, safer, neater grating. Pressure welded construction forms cross bars and main bars into a rugged one-piece grating. Tops of all bars are flush.

Pre-cut to your specifications. Whatever your needs in type and size, factory-fabricated Gary Grating saves you installation time and money. Careful quality control assures dimensional stability, long life and neat appearance.

Gary Grating can also be furnished in a variety of stainless steels and aluminum.

Specify Gary Grating . . . either in steel or aluminum . . . for all your functional and decorative grating and stair tread requirements. Write today for free catalog —Dept. H-7, 4045 E. Seventh Ave., Gary, Indiana

ROCKWELL-STANDARD CORPORATION

Grating Division, Gary, Indiana

ducts were run through a small trench below the ground floor, and vertical risers from this main run independently to each cell.

Ross' firm has become expert in another area — designing for the blind. A training center, an administration center, a crafts manufacturing building, and a residence — all grouped in one area — have been completed on a recent project, and Ross currently is designing a recreation center on a nearby lake.

"This was an interesting job. Electronic eyes were installed in corridors, and a buzzer signal indicates a turn. Elevators have chimes keyed differently for each floor. Since all walls had to be smooth, no heating equipment could project."

Expansion Plans for ACEC

Ross, who is active in the Association of Professional Engineers of Ontario, the American Society of Heating, Refrigerating, and Air-Conditioning Engineers, The American Institute of Electrical Engineers, the Air Pollution Control Federation, Engineering Institute of Canada, and the Canadian Institute of Sewage and Sanitation, has big plans for ACEC during his term of office.

"I would like to see an increase along the Eastern Seaboard. To date, we have no chapter covering New Brunswick and Nova Scotia." In the past, there has been considerable discussion about broadening the membership requirements to allow young consulting engineers to join — perhaps on an associate membership basis. Ross is not in favor of this. "We have strict membership requirements, and we should keep them. However, I would like to see us provide young consultants with copies of the Manual of Practice and keep in touch with them to give any ethical or professional advice possible."

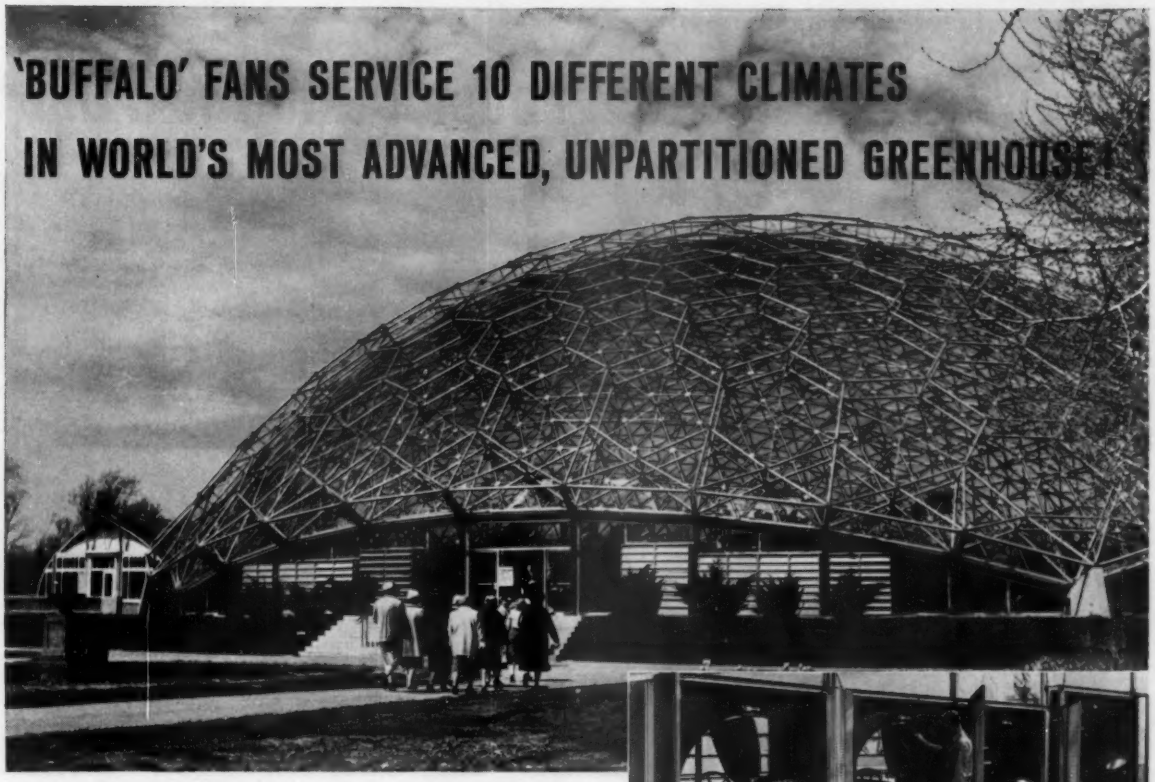
Public relations also is an area in which Ross wants to see ACEC more active. Currently, ACEC is working on a new membership roster which will list members both alphabetically and geographically. A Manual of Practice also is in the final stages.

ACEC also is planning a series of newspaper advertisements to tell the public what a consulting engineer is, what he can do, and where to find him.

Since Consulting Engineers Council and ACEC have most of their problems in common, Ross would like to see close cooperation. "We are both facing government 'empire building,' free engineering, and requests to bid for jobs. Because of the difference in membership requirements, I do not foresee a possible future merger of the two organizations, but I do think they can work together for their mutual benefit."

Ross also is quite enthusiastic about the International Federation of Consulting Engineers. "I am not so concerned about how much FIDIC membership costs Canada as I am what it can do for us, and I think it has great possibilities." ▲▲

'BUFFALO' FANS SERVICE 10 DIFFERENT CLIMATES IN WORLD'S MOST ADVANCED, UNPARTITIONED GREENHOUSE



Architects—MURPHEY & MACKEY, St. Louis; *Consulting Engineer*—PAUL LONDE, St. Louis; *Mechanical Contractor*—EICHLER COMPANY, St. Louis.

Beautiful new Climatron at the Missouri Botanical Garden, St. Louis, is the world's only fully climate-controlled Geodesic dome display greenhouse. Winner of the 1961 R. S. Reynolds Memorial Award, it features an intricate framework of aluminum tubing . . . a ¼" transparent, Plexiglass dome measuring 175' in diameter . . . 70' in height.

At right, one of five 72" and three of fifteen 60" 'Buffalo' Belt-Air Fans with inlet guard and outlet louvers. Two 'Buffalo' BLD Centrifugal Fans were inaccessible for photography.

The award-winning Climatron above was a challenge unique to the air conditioning industry.

Scheduled for close proximity growth in the vast 1,300,000 cubic foot room were a steaming, lowland jungle; cool Hawaiian garden; misty tropical mountain forest; plus rice, coffee, tea and rubber "plantations."

To assure native conditions and proper growth for these exotic plants, five different temperature and humidity zones were required in the daytime . . . five at night. All in all, *ten different climates in a ¾ acre, unpartitioned area.*

Twenty 'Buffalo' Belt-Air Fans were chosen to induce precisely-controlled climates through precisely-defined areas, in the precise flow required. For winter and nighttime use, two 'Buffalo' BLD Fans with thermostatically controlled variable inlet vanes were selected to provide the correct amount of air to heating and humidifying systems. When required, the fifteen 60" and five 72" 'Buffalo' fans can make a complete change of air (1,300,000 cubic feet) in just two minutes . . . without disturbing the 80°F., 85% RH temperature/humidity balance.

This is just one more example of how 'Buffalo' fan engineering versatility can be used to unique advantage throughout industry and commerce.

"Buffalo"

AIR HANDLING DIVISION

BUFFALO FORGE COMPANY

Buffalo, New York

Canadian Blower & Forge Co., Ltd., Kitchener, Ont.

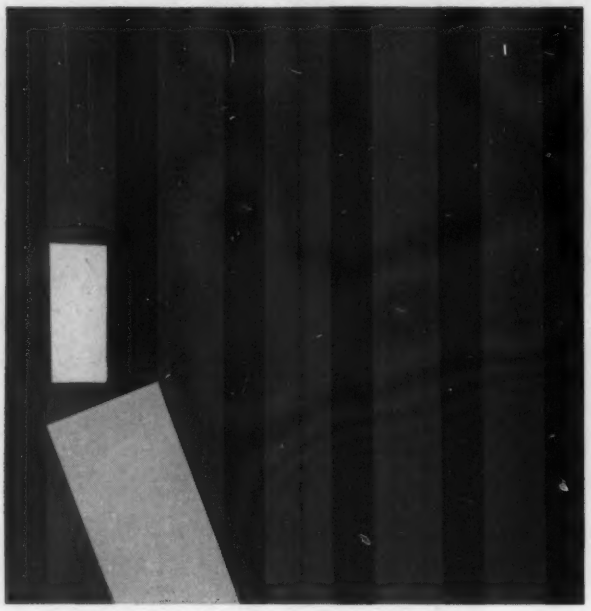
'Buffalo' Air Handling Equipment to move, heat, cool, dehumidify and clean air and other gases.

'Buffalo' Machine Tools to drill, punch, shear, bend, slit, notch and cope for production or plant maintenance.

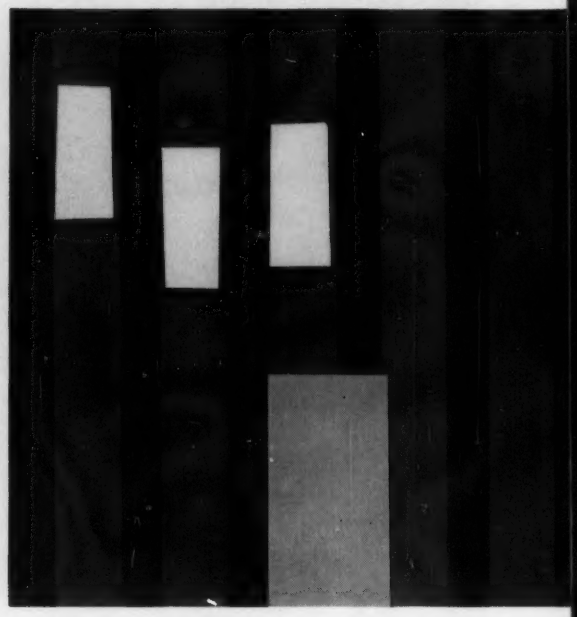
'Buffalo' Centrifugal Pumps to handle most liquids and slurries under a variety of conditions.

Squier Machinery to process sugar cane, coffee and rice. Special processing machinery for chemicals.

How the Westinghouse De-ion® Arc Chute

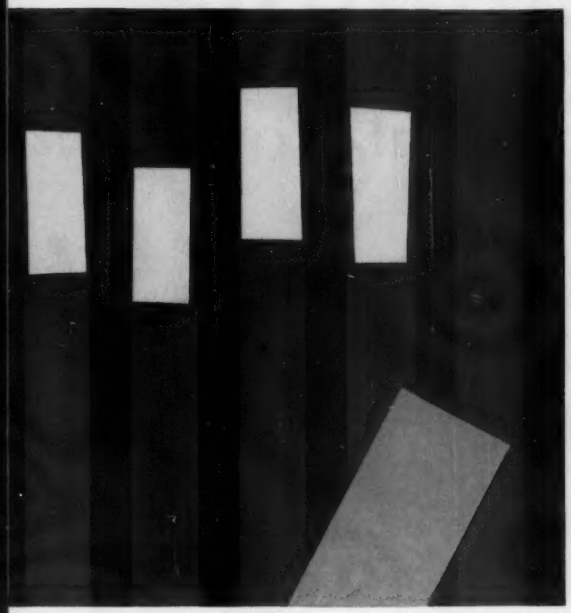


ARC FORMED on interrupting

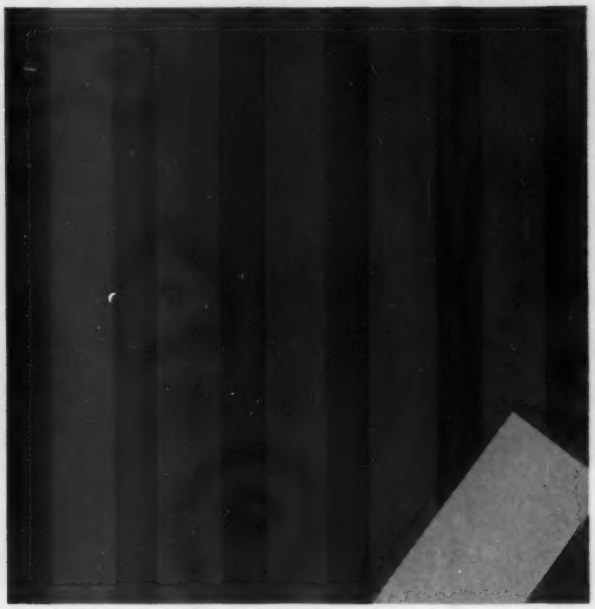


CONFINED within grid plates of quencher

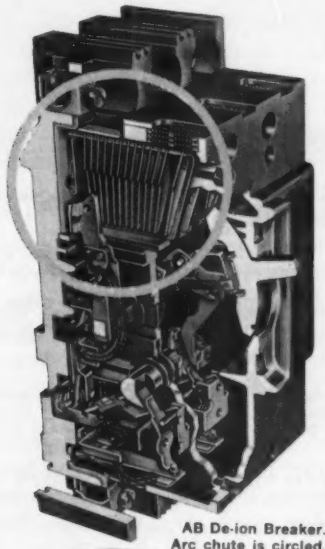
extinguishes breaker arcs in ½-cycle or less!



DIVIDED into small, harmless segments



EXTINGUISHED by the mass of grid plates



AB De-ion Breaker. Arc chute is circled.

Every time you break an electric circuit, an arc is formed. This arc must be controlled quickly and safely to protect the system. The finest and safest device to control arcs is the DE-ION® arc quencher in *all* Westinghouse AB circuit breakers.

The design of the chamber confines the arc and quenches it by dividing it into small harmless segments which are cooled and extinguished by the mass of surrounding material. The action within the arc chute is quick and positive.

See the quenching action in full color in Westinghouse's "Arc in Action" high speed photography flip book. It's free . . . ask your Westinghouse representative for a copy of SA-8900 or write: Westinghouse Electric Corporation, Standard Control Division, Beaver, Pa. *You can be sure . . . if it's Westinghouse.*

J-30327

Westinghouse

From the Editor's

Tranquil Tower

Hard Words from Phoenix

"WHO GAVE the ECPD the authority to accredit? This is unimportant. ECPD asserted its authority as a professional body. Nobody of any standing denied it had such authority. Its purposes were clear and widely accepted in the profession. ECPD exercises its accrediting authority judiciously and temperately.

"What does the ECPD experience teach us as to other phases of professional improvement? I suggest the general lesson is this: professional improvement requires sanctions as well as persuasion — sanctions exercised judiciously for clear purposes widely accepted by the profession." – G. Brooks Earnest, F. ASCE, President Fenn College, Cleveland, Ohio, and official nominee for president of ASCE, in an address given at General Membership Luncheon, Phoenix Convention of ASCE.

These are hard words. If the general membership of ASCE does not yet realize just how hard they are, it is easy to understand. The presidents of our national engineering organizations generally seem to live in a platitudinous world of good fellowship. We just simply do not expect them to get tough.

The key word in Earnest's address is "sanction." If there is any doubt that it is a hard word, notice that *Webster's* uses the word "coercive" several times in an effort to define it. Even *Webster's* mildest language states that a sanction is, "that which induces observance of law or custom."

In simple language, what the president-to-be of ASCE is saying is this: If the majority of the members of an engineering organization believe that engineering is a profession, they must assume the authority to kick out the minority group which does not agree with them. True, Earnest would begin with persuasion, and he would use the power to kick judiciously, but kick he would, whenever it became absolutely necessary.

There were many other refreshing aspects of Earnest's address. For example, he does not subscribe to a professional code of ethics which is complacently assumed to be written only for those engineers engaged in private practice. What is good for one, says Earnest, is good for all – even engineers in industry.

Industrial management has long suspected that its employee-engineer's claim to professional status sometimes is just a cheap substitute for union membership. It is cheap, for no engineering organization's annual dues comes anywhere close to the annual dues which union members pay into the local and national coffers. It is a substitute if the engineering society member has joined up simply because he is ashamed to join a union organization.

If engineers in industry are truly professionals, Earnest suggests that they should have the guts to rate their companies, just as ECPD rates engineering colleges – and as doctors rate hospitals, and lawyers rate courts by seeking a change of venue or appealing to a higher court.

Lest consulting engineers get their thumbs caught too tightly in their lapels at this point, it should be noted that Earnest also has a few hard words for them. However, it is obvious that he is not a reckless man. He does not lay on at random. Rather, he has selected a few important sore spots and probed them with the full intention of annoying.

It is not often that the engineering fraternity gets such frank talk. G. Brooks Earnest's address is recommended reading for every engineer, in any engineering organization, who believes or wants to believe that he is a professional. ▲▲

HERE'S HOW BORDEN FLOOR GRATING CUTS COSTLY FIELD CORRECTIONS . . .

Insures correct dimensions, fit, and placement . . .

1. A shop drawing of the job is submitted to the customer for approval, when necessary. This plan shows the size and shape of the grating area — how grating clears all obstructions.
2. Each finished panel is carefully checked for accuracy of dimensions.
3. Each panel is plainly marked with its number to insure quick, easy installation.
4. The entire platform is laid out on our shop floor. Overall dimensions and obstruction openings are checked against shop drawings.
5. Erection diagram showing panel mark numbers is supplied for field installation.

Write today for *free*
16-page catalog showing all basic types of grating; more than 30 dimensional drawings of subtypes; eight safe load tables for steel and aluminum grating.

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"Greatest name in gratings"

817 GREEN LANE ELIZABETH 2-6410 ELIZABETH, N.J.

Plants at: Union, N.J. — Leeds, Ala. — Conroe, Texas — Beeton, Ontario

BORDEN METAL PRODUCTS CO.

Gentlemen: Please send me NEW 1961 BORDEN Catalog

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TITLE _____

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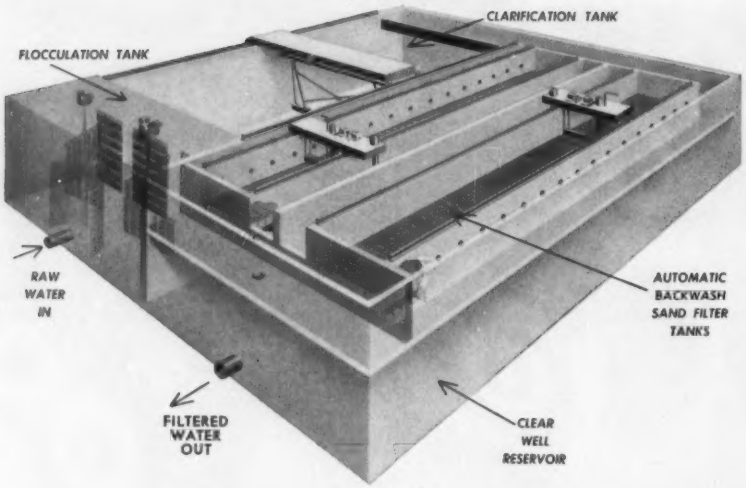
CITY AND STATE _____

NEW *"Unitized"* WATER-TREATMENT SYSTEM *by Hardinge*



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• FLEXIBLE

The practical design for water treatment, which incorporates the safe and established methods for controlled flocculation, sedimentation, rapid sand filtration, and storage — all in one, compact system, sized to your requirements.

With the Hardinge system, initial savings are realized in design, materials and construction. Operating economies are effected in power requirements and plant supervision.

Write for further information, giving us the details of your water problem.

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SAN FRANCISCO
HOUSTON
LAKELAND
BIRMINGHAM

NSPE Policies

In our constant efforts to maintain our good relations with private industry we endeavor to bring to the attention of our field offices the policies and practices established by the professional societies for its members and member organizations. We believe that the article on the NSPE rules and polices regarding competitive bidding, published on page 138 of the April 1961 issue of CONSULTING ENGINEER, would be of interest and of value to our construction-engineering staffs.

It would therefore be appreciated if we could be granted permission to reproduce the above mentioned article for distribution to our field offices.

L. G. Mohr
Assistant Director
U. S. Atomic Energy Commission

The Beauty of Billboards

The staff article "Highways . . . " in the interesting April 1961 issue sparkles with brisk summaries of subjects, which, if studied a lifetime, would perhaps not again so easily resolve themselves.

Having spent at least a part of one lifetime in engineering and in outdoor advertising, and a part of that in being curious about facts, it seems to me important at the moment to ask for a copy of the

Readers' Comment

list of the accidents which your staff writer consulted before writing on page 105, after dismissing aesthetics, that "yet there is some evidence that the billboard is a contributory cause of accidents."

I also think that your editorial phrase — "it is a characteristic quirk of the human mind that that which is not understood is evil"— applies not only to the failure of the consulting engineering profession to explain itself to the public, but applies also to many other endeavors — including outdoor advertising.

Edwin E. Kinney
Outdoor Advertising
Association of America

Friendly Relations

Recently, I enjoyed reading the excellent translation published in the May issue of *L'Ingenieur-Conseil de France*, of the article of Fred G. Goff "How to Develop Productive Client Relations," from the March issue of CONSULTING ENGINEER. Having been somewhat instrumental in the straightening out of the liaison between those two valuable publications, I feel gratified at this renewal of friendly professional information exchange.

G. L. Blanchard, P. E.
Chicago

Corporate Practice

In your May 1961 and June 1961 issues, the section entitled "The Legal Aspect" was devoted to what was purported to be "a study

GUTH HOSPITAL BED LIGHTS

"CIRCLES" of high efficiency lighting . . . FOR PATIENT, CHEER AND EYE-EASE

TAKE YOUR PICK OF SIX MODERN MODELS

Every Guth unit is designed to fill the patient's point of view with high efficiency lighting. They chase "the gloom" and keep the eyes much brighter!

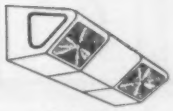
The Guth selection is complete—a light that's right for every ward or room: 1, 2, or 3 prismatic lens for downlight, in 1, 2, or 3 gang units. Available with Nite Lites, Pull Switches or Receptacles. Almost unlimited combinations for complete versatility and variations in footcandles required.

*Footcandle readings based on 1, 2 and 3 100W lamps, with 1, 2 and 3 prismatic downlight lenses respectively.

Pyrex glass for uplight (they lift out for easy service). Exteriors Silvan finished (stainless steel available). Interior reflecting surfaces are baked-on white Acrylic enamel.

B1300/N Series

B1305/N Series


B1304/N Series

B1303/N Series

B1301/N Series

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KENNEDY'S

Union Bonnet and Cylindrical Body Increase Valve Life . . .

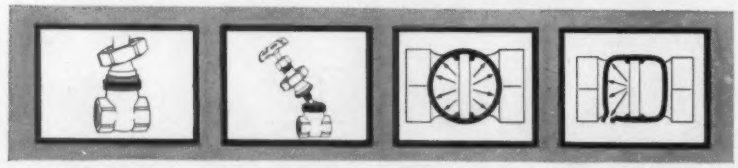
Heavy bronze union bonnet ring is entirely separate from the bonnet to eliminate any possibility of springing the bonnet face when assembling or disassembling the valve.

Cylindrical body withstands sudden pressure. This construction resists rupture and minimizes deflection when under severe pressure. Pressure in ordinary valve bodies tries to push the body wall out. Rupturing stresses concentrate where wall has the shortest radius. This deflection causes early valve failure in ordinary valves.

● *Write today for complete details.*

Fig. 525

125 lb. S.W.P. Bronze Gate Valve
Union Bonnet ● Rising Stem
Inside Screw ● Wedge Disc



Kennedy's Union Bonnet permits repeated dismantling for cleaning or inspection and reassembly without danger of distortion of the valve. The bronze-to-bronze construction makes a tight union for tight, leakproof operation.

Kennedy's Fig. 525 can be easily disassembled into component parts for installation in otherwise inaccessable places in existing lines or for new installations.

Kennedy's cylindrical body construction when under severe pressure resists rupture and minimizes deflection thus preventing leakage at the seat.

Pressure in ordinary non-cylindrical valve bodies tries to push the body wall out to form a circle or cylinder. Rupturing stresses concentrate where wall has the shortest radius. Resultant deflection causes leakage over disc and early failure.

KENNEDY VALVE MFG. CO.
ELMIRA, NEW YORK
VALVES • PIPE FITTINGS • FIRE HYDRANTS
● OFFICES AND WAREHOUSES IN NEW YORK, CHICAGO, SEATTLE, SAN FRANCISCO ATLANTA ● SALES REPRESENTATIVES IN PRINCIPAL CITIES ●

of the current battle over corporate practice in the State of Washington." In addition to being untimely, since the amendment to the Registration Act signed into law on March 16, 1961 ended the controversy for the current biennium, the articles present a gross distortion of both the issues involved and the parts played by the organizations cited.

The 1961 amendment to the Washington Professional Engineers Registration Act was prepared by the Washington Society of Professional Engineers after two years of study and consultation with all segments of the engineering profession. Contrary to the implication in your articles, the WSPE amendment was strongly endorsed and supported by the Washington Industry Committee on Engineering Practices, who were speaking for the industrial community of the State as those most directly affected by legislation barring the major national engineering firms from practice in the State. The WSPE amendment was also strongly endorsed and supported by the Committee on Engineering Laws, speaking in behalf of the national engineering corporations.

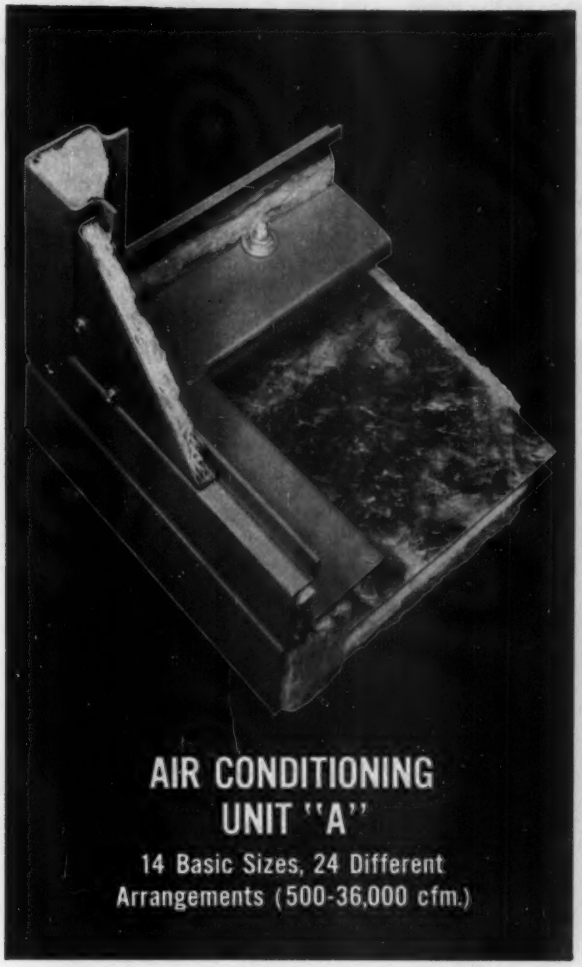
The only opposition to the WSPE amendment consisted of a small, self-appointed group who incorporated as the Professional Engineers Legislative Committee, Incorporated. This group's claim of widespread support among the engineers of the state was discredited to the extent that the WSPE amendment passed the Senate by a vote of 41 to 6, and the House of Representatives by a vote of 72 to 6.

G. J. Cavanagh, P. E.
Construction Engineer

Corporate Practice — II

Dr. Melvin Nord, in his article regarding corporate practice in the June 1961 issue of CONSULTING ENGINEER, made some statements concerning the responsibility of an

A test: inspect these frames



AIR CONDITIONING
UNIT "A"
14 Basic Sizes, 24 Different
Arrangements (500-36,000 cfm.)

AIR CONDITIONING
UNIT "D"
12 Basic Sizes, 24 Different
Arrangements (500-36,000 cfm.)

Now, who are the 2 manufacturers?

True, Unit "D" construction could be confused with that on any of several well-known central station air conditioning units.

But it would be hard to mistake Unit "A" for an industry standard. "A" is the exclusive Penta-Post and double drain pan construction offered as standard on *only* Kennard/Nelson *Better Air* (Type A) air conditioning units.

Unit "D" is a Kennard/Nelson product, too! It shows the solid frame of the *Standard* (Type D) line. This is a competitively priced line with many *Better Air* features . . . designed expressly to "meet or exceed" all industry standards.

Two lines. One manufacturer. A Kennard/Nelson line for projects where quality comes first *plus* one for those where an "industry standard" is required.

Your Kennard/Nelson representative will demonstrate these frame styles in your office. Call him or write for literature on these units: American Air Filter Company, Inc., 300 Central Avenue, Louisville, Kentucky.

AAF American Air Filter
BETTER AIR IS OUR BUSINESS

engineer in a corporation which must be challenged. I think that the use by Dr. Nord of such statements as "sheer fantasy," "factually hogwash," "pure nonsense," and other such phrases, is a rather clear indication that his article should be considered more in the realm of persuasion to prove a point than a dispassionate consideration of the problem.

In discussing the problem of an engineer working for a corporation, Dr. Nord attempts to make the point that it is impossible for an engineer to control his work because he does not control the purse strings of the corporation. This may be true, but I think a consideration of the activities of the large aircraft companies, for instance, might lead to a different conclusion. I am sure that neither the president of the Douglas Aircraft Corporation nor the president of the Boeing Company were personally responsible for the design decisions which resulted in the final approval of either the DC-8 or the Boeing 707. Here we have a clear example of the way engineering is handled by corporations. Certainly no one will deny that the public welfare and safety is affected by the design of the large jet aircraft which now are being used throughout the world. I think it is also true that the final design decisions on these machines were made by engineers who were not either in financial or executive control of the companies for which they worked.

Dr. Nord takes the position that the contention that an engineer could dictate to the corporation for which he works is, as he says, "factually hogwash." It is only factually hogwash if you start from the premise that all corporations are bad and, therefore, the actions of their officers are heartless. I am sure if you consider the designs of the machines made by General Motors, International Harvester, Allis-Chalmers, and the other manufacturers of machines whose satisfactory performance is absolutely necessary for the safety and welfare of the public, you must come to the conclusion that the engineers who design these machines have a strong voice in their corporations.

To take the position that an engineer loses his desire and ability to protect his own and the public's interests, merely because he works for a corporation, ignores the thousands of engineers in this country who are successfully working in corporations and still maintaining their professional identity.

E. Montford Fucik
Harza Engineering Co.

Corporate Practice — III

The articles . . . certainly do not reflect the actual facts. . . .

The Washington Society of Professional Engineers began its study of the legislative problem concerning the engineering profession in

SHOULD YOU RECOMMEND EMERGENCY LIGHTING TO YOUR CLIENTS?

Statistics show that power fails for 60 minutes in any four and one-half year period with multiple underground transmission . . . up to 50 minutes in every eleven month period in some rural areas.

Based on these figures, no building should be without emergency lighting.

To make your recommendation job easier, Light Warden offers you the Emergency Lighting Handbook. Edited by a Professional Engineer, the Handbook includes typical installations, design problems, efficiencies and information on available lighting units.

A copy of the Emergency Lighting Handbook will be return-mailed at your request. Please write on your letterhead.

LIGHT WARDEN
Chargomatic emergency lighting equipment

ELECTRIC CORD COMPANY
412 Plane Street, Newark 2, New Jersey

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First off, you'll save tremendous amounts of file space . . . be able to keep all your drawings in card files at finger tips—ready for instant reference in a RECORDAK Film Reader. Think how that will do away with the "wait" for costly reference paper prints!

"WHAT ABOUT COPIES?"

Paper prints, original or reduced-size, can be made whenever needed *directly* from the film image by low-cost photographic, or other methods. Duplicate microfilm cards for distribution can also be made quickly from the master cards, which need not leave the file room.

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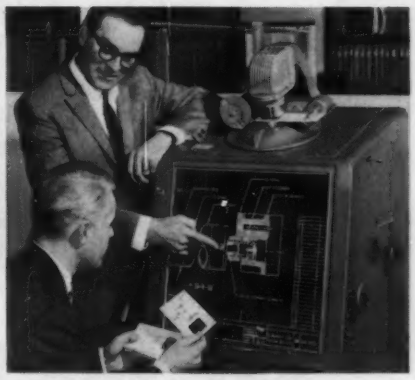
Your staff can easily be trained in the use of Recordak equipment which is especially calibrated to produce these superb images. Mail coupon today for free booklet which goes into more details on precision microfilming available through Recordak or microfilming dealers of Recordak.



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the State of Washington approximately six years ago. It was recognized by many that there was a serious deficiency in the registration act because of revisions, made in 1947, which omitted references to corporate practice. Also, the state Attorney General, in stated opinions, had made it illegal for engineering corporations to practice in the State of Washington.

The Washington Society of Professional Engineers recognized the seriousness of this situation and the need for a constructive legislative approach to the problem. In 1959, they presented to the legislature the results of approximately 18 months study. The action of the Society was opposed by a small group of engineers, mostly independent consultants, who were opposed to corporate practice in any form. The 1959 legislature passed a modified version of the Washington Society's bill limited to a two year period with the understanding that the engineering profession in the State of Washington would present to the 1961 legislature an act which would represent the results of the study of the ensuing two years.

WSPE, through its executive committee, conducted hearings in all parts of the State of Washington during the intervening period, to gain the benefit of the thinking of engineers of all segments of the profession. Numerous drafts of various proposals were made, and reviewed, and the combined result was presented to the legislature in the Spring of 1961.

The proposed legislation as submitted by WSPE was not opposed by the Washington Industries Committee on engineering practice, as your article would lead a reader to believe. Rather, this group of interested industrial leaders supported the legislation proposed by the Washington Society of Professional Engineers. The opposition to the legislation came from the same group who had opposed the 1959 act. By this time, however, this group had modified their original opposition to corporate practice to an acceptance of corporate practice provided the act was so worded to prohibit the major engineering corporations from practicing in this state.

The Washington law on engineering practice is constructive, straightforward, and workable, although probably the most restrictive of any act in the 50 states, insofar as the practice of engineering through the corporate structure is concerned. Those of us who spent many hours of hard work over the past years, in the promotion of sound legislation in the State of Washington relating to the practice of engineering, are convinced that our efforts could well serve as a model for other states.

W. D. Whinery, Jr., President
Tacoma Chapter
WSPE

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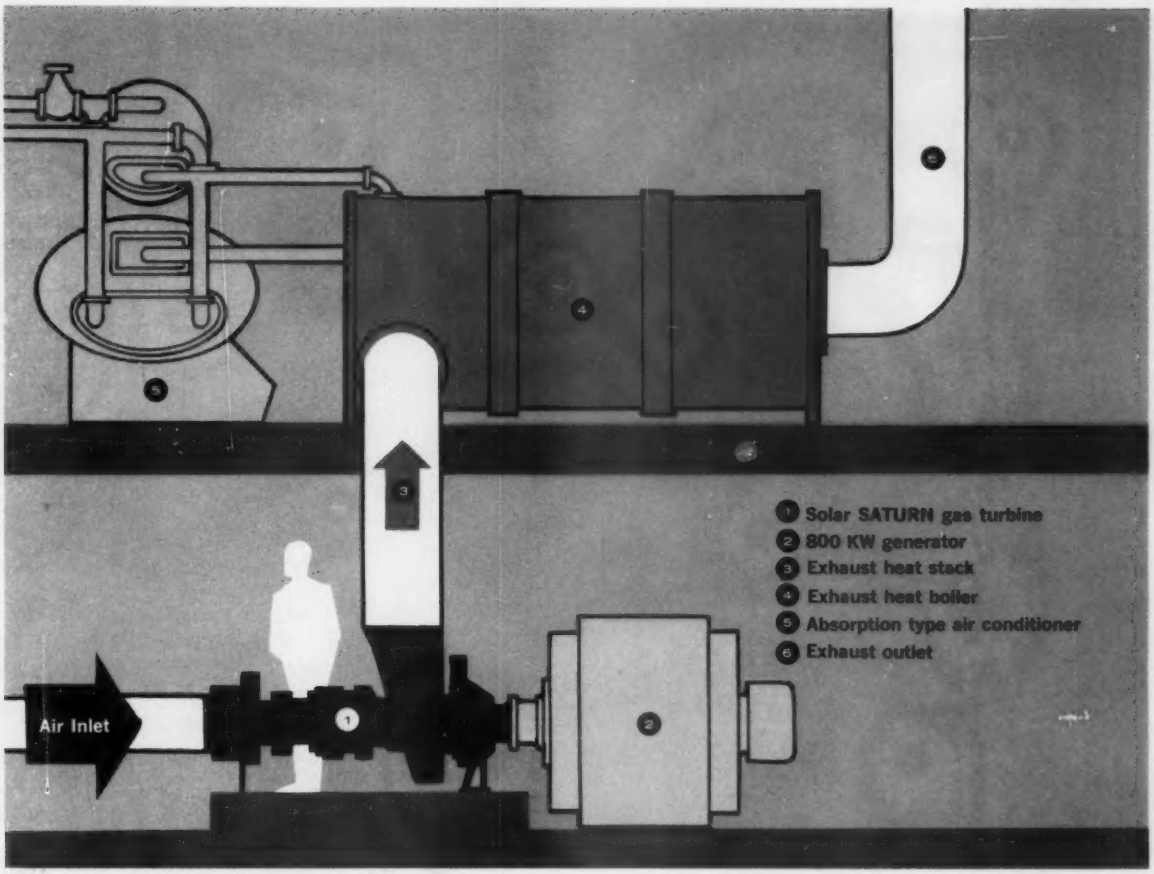

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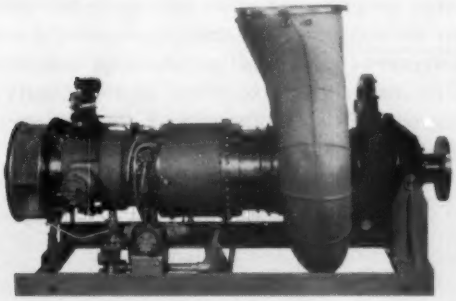

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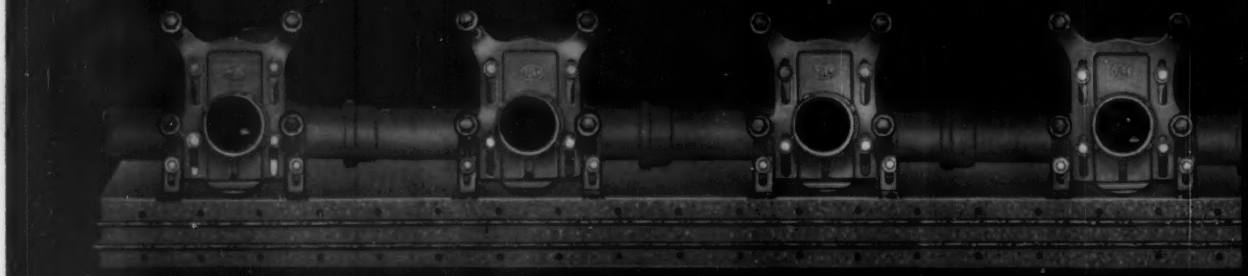

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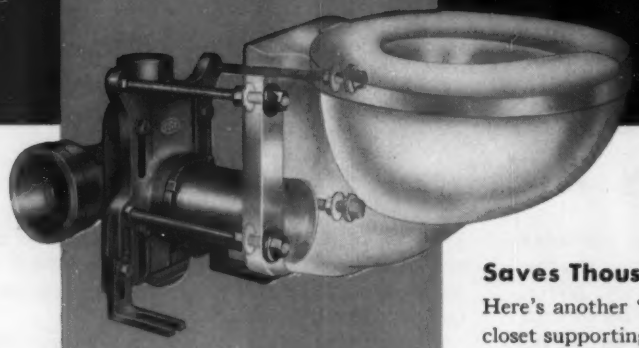

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the only behind-the-wall system that makes possible long-run batteries of off-the-floor siphon-jet water closets without expensive modifications or weakening of structural slabs. Adjusts to all standard closet roughing heights and drainage line pitches.

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Here's another "first" from Zurn creative engineering - - a wall closet supporting system so startlingly different that it saves you thousands of dollars in structural work alone! Now, for the first time . . . you can install long batteries of off-the-floor siphon-jet water closets without costly and time-consuming modifications to structural slabs - - *even when installed on the most modern, thin reinforced monolithic flat plate slabs.*

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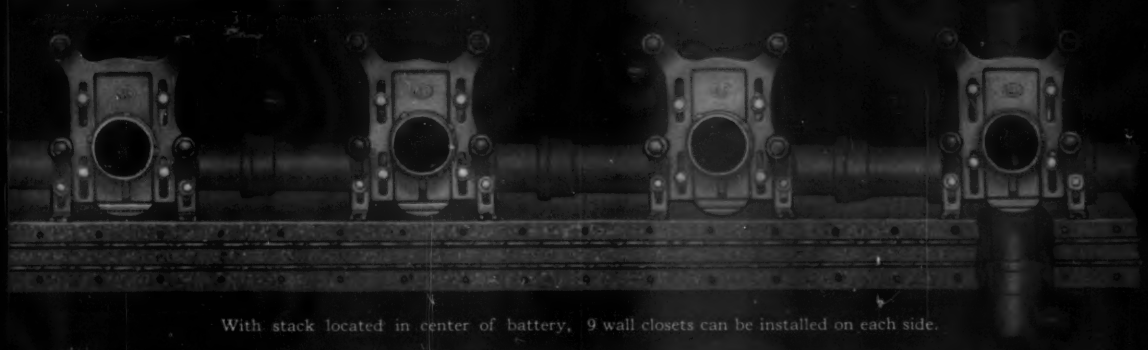

With stack located in center of battery, 9 wall closets can be installed on each side.

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The Legal Aspect

Corporate Practice . . . The Illinois Law

THE BILL originally proposed by the Illinois Association of Consulting Engineers, to permit professional engineers to incorporate, was introduced in the 72nd General Assembly on May 16, 1961, with Representative C. K. Willett as principal sponsor. The following restrictions were included on corporations who could organize under this legislation:

¶ "The principal business of such a corporation is the practice of professional engineering.

¶ "The chief executive officer or managing agent of the corporation is a registered . . . engineer.

¶ "A majority of the directors of the corporation are registered professional engineers.

¶ "All plans, designs, drawings, reports, and specifications issued by or for the corporation are dated and bear the seal and signature of a registered professional engineer."

In addition to these restrictions, the following additional clause was included: "The limitations imposed by [the above] paragraphs . . . shall not be construed to prohibit or restrict any practice otherwise authorized or permitted by this Act."

On June 2, 1961, a hearing was held on this bill in the House License and Miscellany Committee. The bill was approved by the committee with a recommendation "do pass." On June 22, 1961 the bill was approved by the House and went to the Senate for consideration.

It soon became apparent that formidable opposition to the bill could be expected in the Senate. Representatives of several large national engineering firms and some industries expressed grave concern that the bill, if passed as introduced, would seriously curtail or completely prevent their continued business operations in Illinois. An amendment was drafted by this group which would delete the first and third restrictions, and modify the second to read "chief executive officer or managing agent of operations in Illinois."

In the meantime, Senate Bill 804, for an act to authorize professional associations, had been introduced on May 31, 1961, passed in the Senate, and been approved by the House committee with a recommendation "do pass" on June 27, 1961. This bill would appear to provide, for professional persons who organize an association, most of the continuity and tax privileges originally sought in the Corporate Practice Bill. Senate Bill 804 was not sponsored by any engineering groups but would appear to include engineers, along with other pro-

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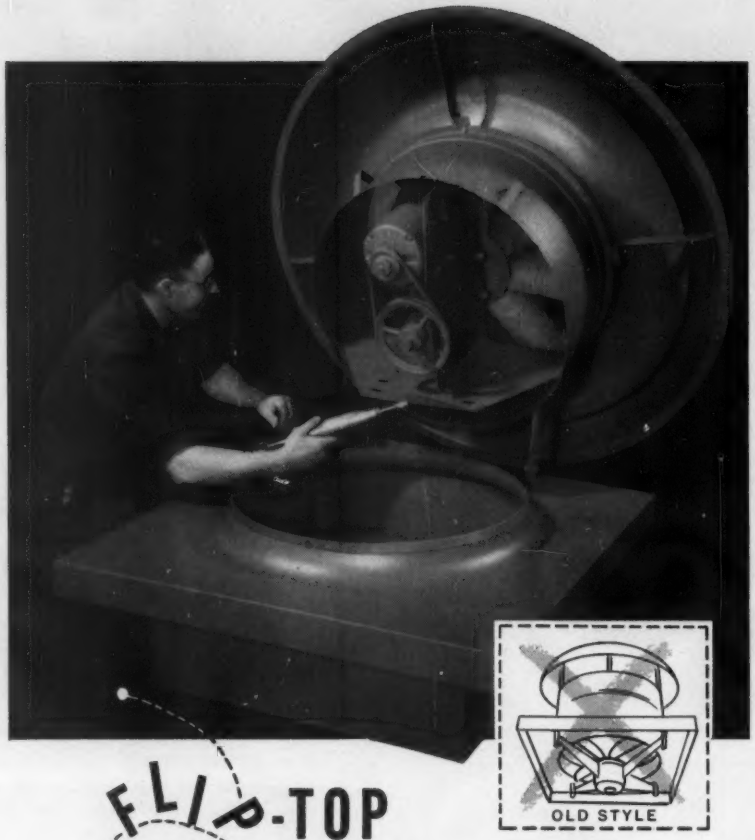

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fessions in its privileges to organize. However, if House Bill 1429 were passed, professional engineers would appear to be excluded from coverage in Senate Bill 804 because they could no longer meet the test "which service by law cannot be performed by a corporation."

A conference was held with representatives of the group opposing House Bill 1429 (the corporate practice bill) on June 28, 1961. At this conference, it was pointed out by ISPE and IACE spokesmen that the restrictions included in House Bill 1429 had been reviewed and discussed extensively over a period of a year and that no compromise could be made on these restrictions. However, it was also pointed out that the bill was not intended to interfere with any professional engineering practices currently permitted to existing corporations. Since there was considerable difference of opinion among the lawyers on whether the latter intention was accomplished by the bill, this amendment was proposed:

"Nor shall anything herein contained be construed to prohibit or restrict the activities of any corporation authorized to do business in this state and engaged in the practice of professional engineering on the date of this . . . act."

This proposal appeared to remove the principal apprehensions of the firms represented at the conference. However, their representatives pointed out that although it would appear to clarify their rights, it would prohibit foreign corporations not now practicing in Illinois from ever practicing in the future. For this reason, they still opposed in principle the restrictions in the original bill. After considerable discussion, an understanding was reached.

The amendment referred to above would be introduced to House Bill 1429 in the Senate License and Miscellany Committee with both groups agreeing to urge the support of the amended

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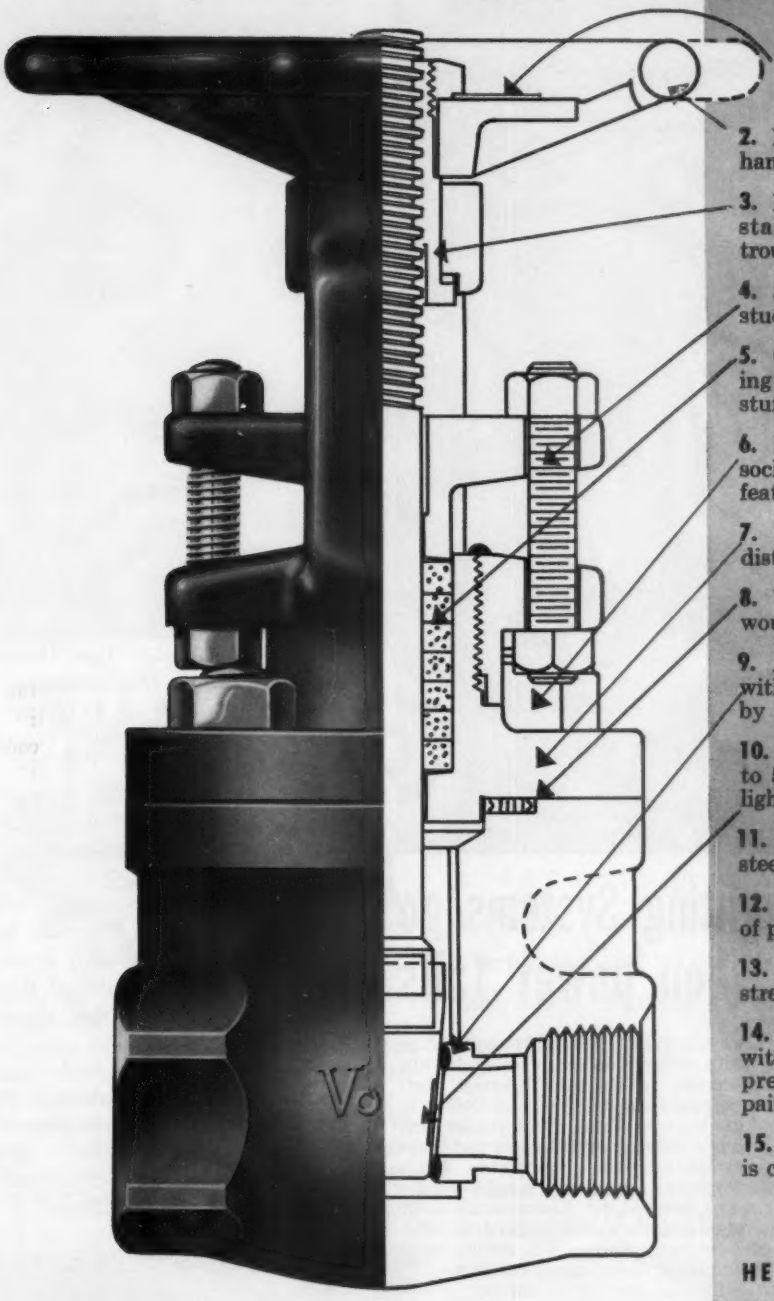

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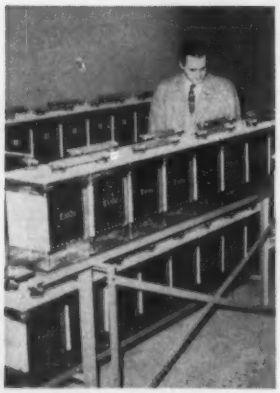

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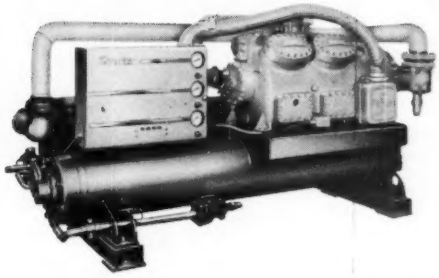
bill. It would then be held on third reading in the Senate until the fate of Senate Bill 804 was known. If Senate Bill 804 passed the House, then House Bill 1429 would be allowed to die without passing. However, if Senate Bill 804 were not passed, then House Bill 1429 would be put up for passage with the opposition reserving the right to make their stand at that time.

At about 1:00 p.m. on June 28, 1961, the Senate License and Miscellany Committee amended and approved House Bill 1429 as planned. Because of the stringent limitations of time and the great number of major bills, as well as less important bills which still faced the Legislature in their final two days, activities were, at best, hectic. As a result, in the final hours, actually Saturday afternoon (the clock had been held at 11:45 p.m. on June 30, 1961), both House Bill 1429 and Senate Bill 804 were passed. (The House concurred in the Senate amendment to HB 1429 at 11:05 p.m. Saturday, less than an hour before final adjournment.)

As of this writing, an arrangement has been made to consult with the Governor's legal counsel. If Senate Bill 804 is to be signed by the Governor, then request will be made that House Bill 1429 be vetoed. However, if for any reason Senate Bill 804 is to be vetoed, then request will be made that House Bill 1429 be signed.

The compromises and judgments which were necessary to carry this legislation to its present status are believed to be in the best interests of all concerned. Unfortunately, the whirlwind activity of the closing days of the legislative session did not permit counseling with a cross section of IACE or ISPE membership or even with the respective governing boards. This is the sad but often inevitable procedure which must be adopted when contested legislation comes up. ▲▲



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These new Carrier packages are available in two models—the water-cooled 30A and condenserless 30B—both factory-assembled and mounted on steel rails for simplified installation. For complete details about these new packages, write Carrier Air Conditioning Company, Syracuse 1, New York. In Canada: Carrier Air Conditioning Ltd., Toronto 14.

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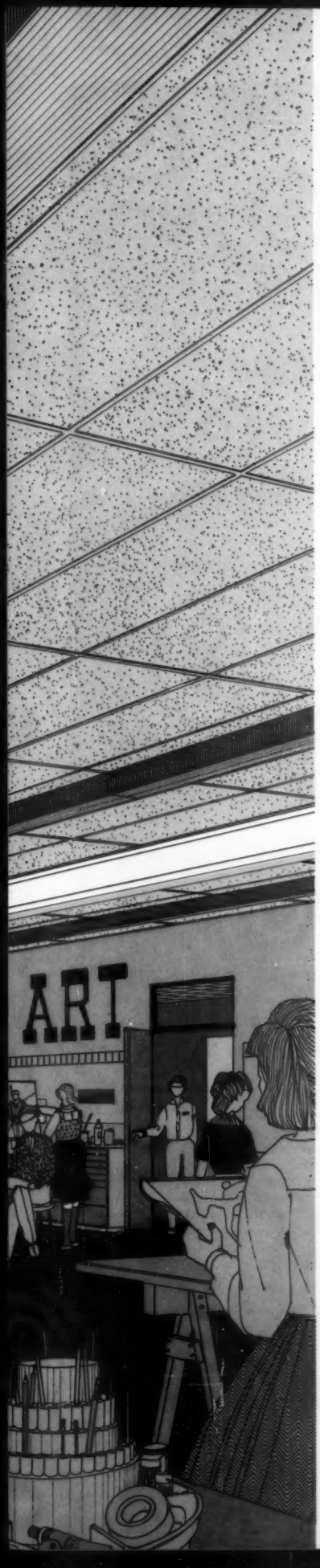
HOW TO



How Armstrong Acoustical Fire Guard is saving this Indianapolis school $34,000 and eight weeks' construction time

THE NEW Perry East Junior High School was especially designed to be a "laboratory of learning" by Indianapolis architects Fleck, Quebe, and Reid Associates, Inc., in association with Mr. Paul W. Seagars, education consultant. It will have facilities for such advanced techniques as language labs, closed circuit television, and block-time teaching. Yet with these many advantages, this school will cost only $14.07 a square foot. One factor making this low figure possible is the specification of Armstrong Acoustical Fire Guard ceilings.

Acoustical Fire Guard 24 x 48-inch *lay-in units* are being installed in all classrooms, including the Art Room featured in this rendering. Fire Guard 12 x 12-inch *tile* is being used in the corridors. Including both tile and lay-in units, there will be 121,000 square feet of Armstrong Acoustical Fire Guard ceilings. The savings in money: $34,000. The savings in time: eight full weeks. Here's why:

Intermediate fire protection no longer necessary

Both acoustical and fire-retardant qualities are built right into Fire Guard. This eliminates the need for installing intermediate fire protection above the suspended acoustical ceiling. Based on the cost of installing conventional "intermediate" fire protection, the architect estimates that Acoustical Fire Guard will save this school approximately $34,000. And the floor-ceiling assemblies using Acoustical Fire Guard easily met Indiana's two-hour assembly and three-hour beam protection fire code requirements.

Fire Guard saves 8 weeks' construction time

With Acoustical Fire Guard, installation is a completely *dry* operation. Carpenters, painters, and other building trades are not delayed while wet work dries. They work right along with the acoustical contractor. Project designer, Mr. C. C. Shropshire, of Fleck, Quebe, and Reid Associates, Inc., estimates Fire Guard will cut this school's construction time 8 weeks.

Exposed grid suspension system

Because of a unique exposed grid system, the lay-in ceiling can be installed quickly and economically. Frequently, it costs considerably less than a combination of conventional fire protection and an acoustical ceiling. And, equally important, the lay-in ceiling allows accessibility to the plenum chamber.

Distinctive designs

To beautify, while they protect, Acoustical Fire Guard tile and lay-in units are available in both the Classic and Fissured designs. Tile also offers a Full Random design. General Contractor for this school is the F. A. Wilhelm Co., Inc., and the Acoustical Contractor is Commercial Floor Covering and Acoustics, Inc., both of Indianapolis.

For full details about Acoustical Fire Guard, call your Armstrong Acoustical Contractor (he's in the Yellow Pages under "Acoustical Ceilings") or your nearest Armstrong District Office. Or write to Armstrong Cork Co., 4208 Park Ave., Lancaster, Pennsylvania.

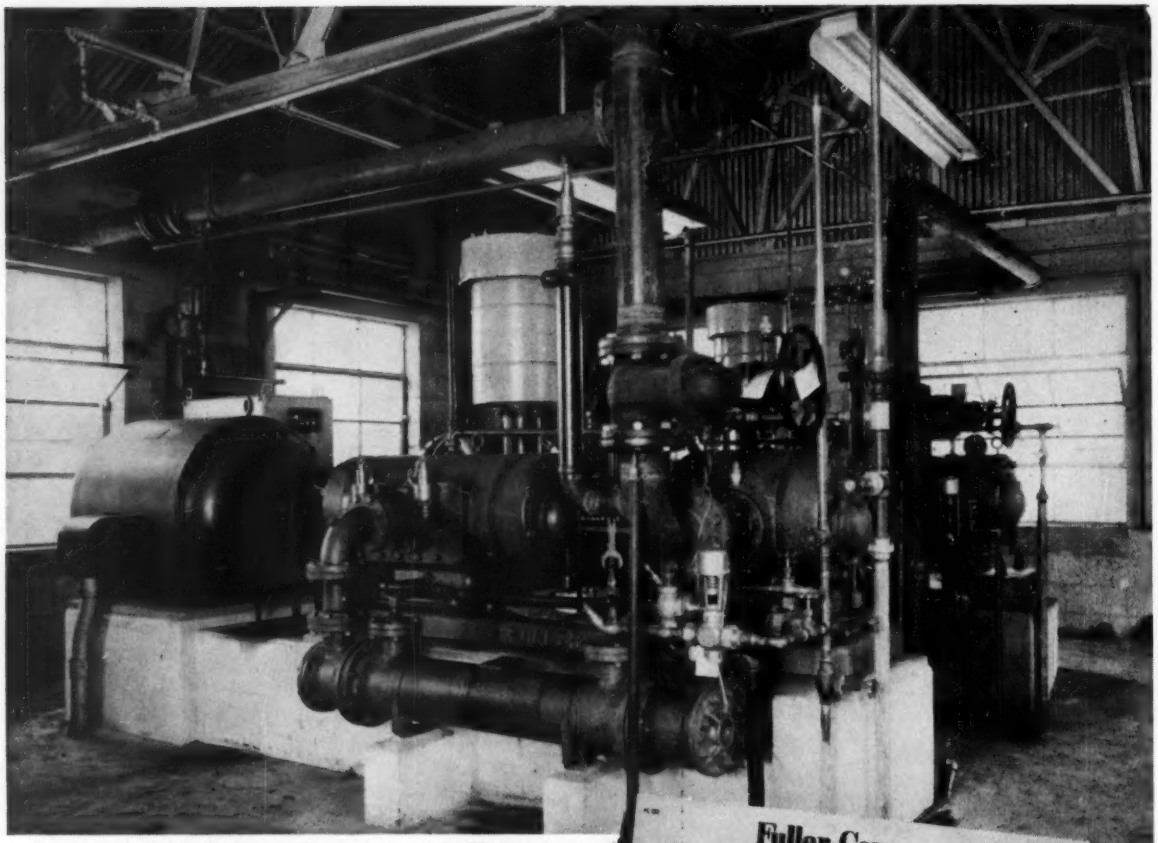
Here are 9 Acoustical Fire Guard UL ratings most frequently used to meet fire code requirements

FIRE GUARD LAY-IN		FIRE GUARD TILE	
Floor & Ceiling Design	Rating	Floor & Ceiling Design	Rating
#30	2-hr. (Beam—3-hr.)	#31	4-hr.
		#21	4-hr.
#13	2-hr. (Beam—3-hr.)	#8	2-hr.
		#7	1½-hr.
#21	2-hr.	#9	1-hr.
#8	1½-hr.		

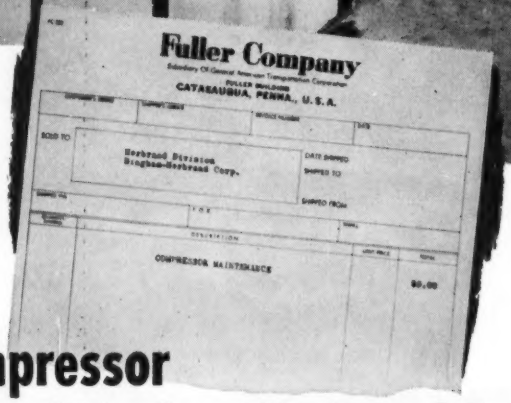
Armstrong ACOUSTICAL CEILINGS

First in fire-retardant acoustical ceilings

Rendering by Helmut Jacoby



Two C135/135H Fuller Rotary Compressors at the Herbrand Division of the Bingham-Herbrand Corp., Fremont, Ohio, leading manufacturer of forged mechanics' hand tools and steel forgings for the automotive industry. Each compressor is rated 680 cfm, atmosphere to 100/110 psig., at 690 RPM.



Here's the 4-Year Maintenance Bill on Fuller Rotary Compressor at Herbrand Division of Bingham-Herbrand Corp.

So satisfactory was the performance of its first Fuller Rotary Compressor, installed in 1956, that Herbrand Division installed another like it 3½ years later.

When the older unit was inspected after four years operation, no replacement of parts was necessary. After installation of a new gasket (cost $9.35)—to replace the one that had to be removed to make inspection—the compressor continues to add to its service record.

The newer compressor has also been entirely trouble-free, and Herbrand plans a third, when increased air capacity is required. It, too, will be a Fuller—for, as Herbrand says, "These compressors can be classified as maintenance-free."

Because Fuller Rotary Compressors are practically vibration-free, they can be installed without complicated or expensive foundations or structural modifications. They are simple and efficient, with no valves to leak, no seats to grind. Blades automatically compensate for wear. They have forced-feed lubrication to all parts within the cylinder. Rotor, bearings and blades are the only moving parts.

Fuller Compressors range from 30 to 3300 cfm, pressures to 125-lb. gauge.

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The Word From Washington

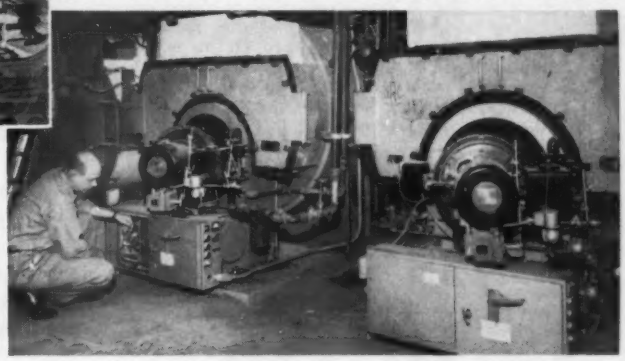
EDGAR A. POE, Consulting Engineer Correspondent

More on FHA Soil Testing Device

Consulting engineers dealing with various types of soils will be interested in the technical study report, which recently came off the presses, titled "The FHA PVC Meter." A brief reference to this small apparatus, designed to measure the swell index of some clay soils, was made in this column a year ago. However, the new report includes all research background, a summary of environment and moisture conditions related to volume change and behavior, and a complete explanation of the laboratory testing program conducted in the development and calibration of the soil testing device. Drawings and photos are included.

The Federal Housing Administration insures mortgages on residences. If the mortgagor defaults on his payments, FHA assumes ownership of the house and pays the bank the unpaid mortgage balance. To keep losses at a minimum, the FHA only insures mortgages on residences that meet certain construction standards and specifications. Foundation soils causing damage to many dwellings are the so-called swelling or expansive soils. In an effort to aid personnel unfamiliar with soil engineering and soil classification,

O'HARE INN . . . *Chicago's beautiful new Jet-Age Motel welcomes travelers with every modern comfort and convenience.*



JOHNSON

FORCED DRAFT OIL-AND-GAS BURNERS

give O'Hare Inn guests the last word in Heating Comfort in the Winter and Cooling Comfort in the Summer

Just two minutes north of Chicago's O'Hare International Airport, this strikingly attractive 32 acre O'Hare Inn offers luxurious hospitality to wayfarers. It is significant that the burners selected to power the heating and cooling systems of this modern Motel, were three 100 H.P. Johnson Model 53 Forced Draft units which can be fired on either oil or gas.* The heating contractor was the Illinois Heating and Ventilating Co. and the installation was done by the S. T. Johnson Burner Service, Inc.

If you are looking for heating efficiency and economy, you might well follow the example of O'Hare Inn and install these world famous Johnson Forced Draft Units.

Year in and year out, they deliver faithful, low-cost performance *regardless of stack conditions or variable firebox pressures.* Operation is entirely automatic. Fuel consumption and maintenance expenses are reduced to a minimum. The burners come to you completely assembled, wired and tested . . . a time and labor saving "package unit" ready for easy installation.

They are available for oil firing, gas firing, or combination oil-and-gas firing, in nine sizes ranging from 28 to 560 H.P. If you plan a new installation, or a modernization of your old system, by all means make it a point to learn how Johnson Forced Draft Burners can simplify your heating problems and minimize your costs.

*An 80 H.P. gas burning Johnson Bankheat Forced Draft Burner also was installed to provide steam for cooking and kitchen demands.

S. T. JOHNSON CO.

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CHURCH ROAD BRIDGEPORT, PA.

Johnson Oil Burners

NOW...

a full-flow

SWING-CHECK VALVE

AND

a FLOW SWITCH

BY

MAGNETROL® model FCV

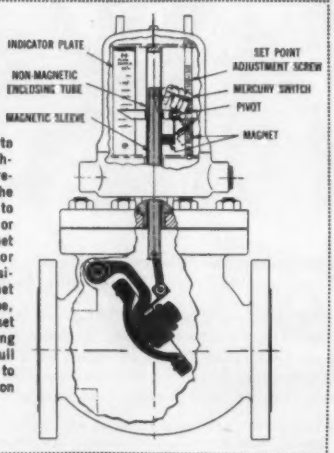
DEPENDABLE AS THE PULL OF A MAGNET

- Remotely Signals Flow—No-Flow
- Interlocks Safety Start-Up or Shut-Down
- Dial Adjustment of Switch Operating Point
- Seals Against Back-Flow

FOR PRACTICALLY ANY LIQUID, TEMPERATURE OR PRESSURE

The new Magnetrol FCV combines a swing check valve with an externally adjustable Magnetrol switch, calibrated for pre-set flow rates. It provides positive flow signal or control at any pre-set valve disc position within 15° to 55° of full closed position. Swing check valve also seals off back-flow — no need to isolate valve from line on shut-down or when changing tanks or lines. Full 90°-swing of disc permits passage of "pigs" or scrapers through line when handling various liquids in sequence, without interrupting flow. Explosion-proof housing, mercury-to-mercury switch contacts, or pneumatic pilot mechanism.

HOW IT WORKS



A magnetic sleeve, linked to the valve disc, is raised within a nonmagnetic pressure-tight enclosing tube as the disc swings in response to flow. This sleeve attracts or releases a permanent magnet attached to a mercury or pneumatic switch. By positioning the pivoted magnet higher or lower on the tube, switch actuation may be set for any point of disc swing within 15° to 55° of full closed position, according to calibrated indicator panel on the switch mechanism.

Mail coupon today for full details—just attach to your letterhead

MAGNETROL, Inc.

5305 Belmont Road, Downers Grove, Illinois

Please send me catalog data and full information on Magnetrol Swing-Check Valves — 19

Name_____

FHA had to develop this field testing device capable of identifying expansive soils.

Wages and Hours

Under the new wage-hour law, the $1.15 an hour minimum wage goes into effect September 3. Two years later, it will be increased to $1.25. However, for newly covered employees the minimum rate will be $1 an hour in September, $1.15 three years later, and $1.25 in September 1965.

Remaining unchanged is overtime pay for currently covered employees. The overtime formula is time-and-a-half the regular rate for work in excess of 40 hours. There will be no overtime requirements for newly covered employees until September 1963. Then overtime time-and-a-half pay will become effective after 44 hours. A year later it will become effective after 42 hours, and in September 1965, it will become effective after 40 hours.

Union Legislation

A measure that would require a favorable secret ballot before unions could call a strike to enforce contract demands is pending in Congress. Under the bill, authored by Senator Karl Mundt, Republican of South Dakota, a strike vote would be taken in the 60-day period before a labor-management agreement ends. If a majority of the employees vote in favor of a strike, union leaders have the power to call a walkout anytime during the 60 days. Senator Mundt would let the workers choose between contract acceptance of a "final offer" by the company and a strike wherever possible.

Race to the Moon

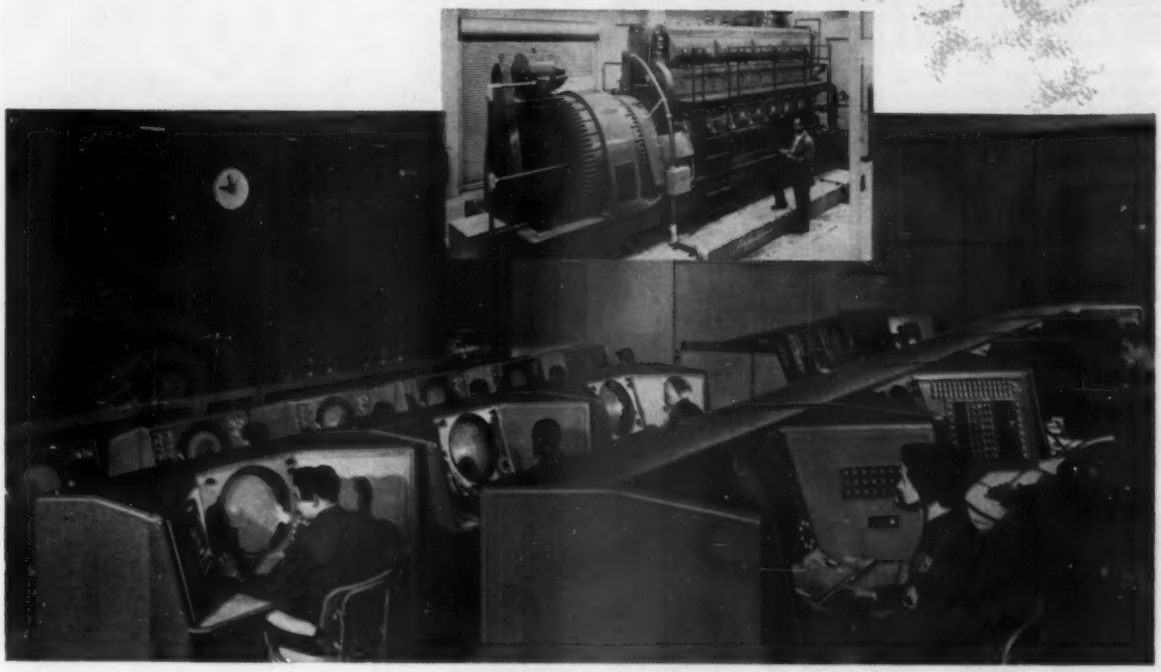
The past president of the International Astronautical Federation, Andrew Haley, predicts that within 20 years the space and astronautics industry will be bigger than the automotive industry in this country. Numerous economists are now forecasting that the space age may be one of the big jobmakers of the future. Some scientists have predicted to Congress that whoever controls space ultimately will control the entire world.

Meanwhile, the National Aeronautics and Space Administration is stepping up its efforts on behalf of "Saturn," America's lone entry in the race for the moon. Some of the top scientists in the nation's Capital feel that the Soviet Union is not more than six months away – if that much – in their efforts to land men on the moon and bring them back.

Interstate Program

Work for consulting engineers on the Interstate Highway Program may be stepped up in the months ahead. Under terms of a new bill, which raises taxes on truckers and tires and cancels a scheduled cut in

WHITE SUPERIOR ENGINES



Operations Room—heart of *Missile Master*. System was designed and produced by Orlando Division of The Martin Company, in cooperation with U. S. Army Signal Corps.

...on guard with MISSILE MASTER

At U.S. Army *Missile Master* anti-aircraft installations near Pittsburgh, Chicago and Los Angeles, standby power is supplied by 8-cylinder, supercharged Model 65 White Superior engines. The 12 engines (4 at each site) develop 1415 BHP at 600 RPM to drive 1000 KW generators. The engine-generators produce precise frequency to operate radars, communication and data transmission links, visual display consoles, computers and fire integration facilities. *Missile Master's* electronic system provides semi-automatic coordination and fire direction for Nike missile batteries, and has been installed near vital U.S. metropolitan and industrial centers.

Missile Master joins a growing, impressive list of Superior-powered U.S. defense assignments that are convincing evidence Superior engines provide rugged dependability, trouble-free performance and economical fuel consumption. Superior engines —215 to 2150 HP or 150 to 1500 KW—will also meet your exact power requirements. Write today for complete information.

Superior ENGINES | White DIESEL

White Diesel

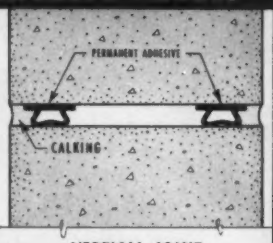
WHITE DIESEL ENGINE DIVISION
THE WHITE MOTOR COMPANY
Plant and General Offices: Springfield, Ohio

RUBBER or VINYL

SEALS and GASKETS

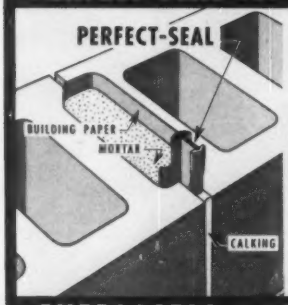
for PRECAST CONCRETE PANELS

Williams Panel Seals (Pats. Pend.) were developed especially for use in vertical and horizontal joints of precast concrete wall panels . . . they are extrusions of expanded, closed-cell Neoprene Rubber. This closed-cell material, and the hollow-core design, provide the properties which assure a positive pressure-contact seal in panel joints under all conditions—each type of seal readily compensates for variations in joint width, irregular joint surfaces and erection adjustments.



VERTICAL JOINT
6" Precast Concrete Panel

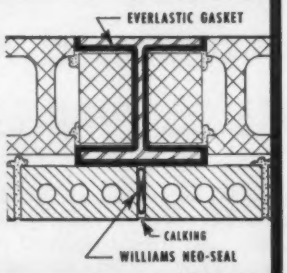
PERFECT-SEAL for CONTROL JOINTS



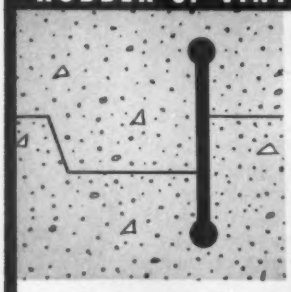
Williams "Perfect-Seal" (Pat. Pend.) is a specially designed seal for use in Mortar-Keyed Control Joints . . . It provides continuous four-point pressure-contact sealing which keeps moisture out of joints and prevents air passage. The T-Section is a high-grade rubber compound; the cross-sealing member at the base of the "T" is a strip of readily compressible, non-absorbent, expanded closed-cell Neoprene Rubber—it provides an effective pressure-contact seal directly behind the calking.

EVERLASTIC MASONRY GASKETS

Everlastic Masonry Gaskets are a readily compressible, nonabsorbent Elastomer which is impervious to water and inert to heat, cold and acids. In masonry joints, they permit linear expansion, and seal the joints against moisture penetration which causes frost damage. Everlastic Gaskets should be used between sill and coping stones, stone or prefab metal wall panels, and to isolate and cushion all steel or concrete columns to permit normal movement without damage to masonry walls.



RUBBER or VINYL WATERSTOPS



Williams Waterstops are made from Natural Rubber Stock and designed for maximum effectiveness in any type of cast-in-place construction joint. They will bend around corners, and will not crack or tear from shear action. Tensile Test: 3990 lbs., Elongation Test: 650%. Available in rolls up to 80 feet in length. Molded union and junction fittings available. Williams Waterstops can be furnished in Vinyl or Neoprene for industrial uses where resistance to oil or other injurious wastes is desirable.

See Sweet's Files, or Write for Information.

WILLIAMS

EQUIPMENT and SUPPLY CO.

486 W. Eight Mile Rd., Hazel Park, Michigan

gasoline taxes, an additional $11½ million is authorized in roadbuilding grants to the various states.

The law is designed to keep the 41,000-mile, divided, multilaned Interstate System on a pay-as-you-go basis until it is completed in 1972. The states will continue to put up $1 for each $9 from the Federal government, but the states must assume the responsibility for the upkeep — not an insignificant item.

Battle for Nationalized Electric Utilities

The 1000 rural electric cooperatives, through the board of directors of the National Rural Electric Cooperative Association, is striking hard at the investor-owned electric utilities. The NRECA board is urging the Kennedy Administration to exert leadership in opposing what it called a "multi-million dollar lobbying and propaganda campaign" against Federal power programs. The resolution declared that "commercial power utilities and their allies" are threatening to destroy the administration's projected resource development program.

The resolution pointed to President Kennedy's major campaign speech on resources development at Billings, Montana, in the fall of 1961, pledging to reverse the "no new starts" policy of the Eisenhower Administration. At the same time, he pledged that he would "move ahead on comprehensive plans for multipurpose river development."

The new administrator of the Rural Electrification Administration, Norman M. Clapp, delcares that the Kennedy Administration will make sure that REA is here to stay. According to him, REA will make a concerted effort to assure cooperatives that they will be given a supply of power sufficient to guarantee that they will have a permanent and important role in the American power industry.

The administrator said REA is taking a careful look at the agency's generation and transmission policies to see whether they go far enough. There is nothing in the REA act which prohibits a co-op from serving a large-load consumer, so long as it is presently unserved and is located in a rural area under the definition of the act. "In fact," said Clapp, "under the act, REA loan beneficiaries are specifically defined to include both the farm and nonfarm population."

ICA Policy Review

The International Cooperation Administration has initiated a full-scale review of its cooperative assistance program. ICA director Henry R. Labouisse asserts that greater emphasis on development and assistance on cooperative projects in underdeveloped countries is going to be the keynote of the agency. Many of the projects are of marked interest to consulting engineers of this country.

Labouisse is also chairman of the President's Task Force on Economic Assistance, which drew up plans

ON GUARD IN INDEPENDENCE SQUARE

About 75 feet away from Independence Hall, in the park to the south, stand R. D. Wood Hydrants like sentinels on duty. While their proximity to the Nation's most revered historic monument does not necessarily imply endorsement, we nevertheless like to think of them there, on guard night and day against the fire that could destroy what Gen. Howe saw fit to spare, and Clinton too, in the British occupation. But R. D. Wood Hydrants need no endorsement. For over a century they have shown themselves to be in constant readiness for any emergency. Of simple, ingenious design and rugged construction, R. D. Wood Hydrants are protected against ice and sediment—function smoothly when the engines arrive. There could be no better protection for any community than R. D. Wood Hydrants—and there could be no better protection for the birthplace of the U.S.A.

Conform to A.W.W.A. specifications

R. D. WOOD COMPANY

Established in 1803

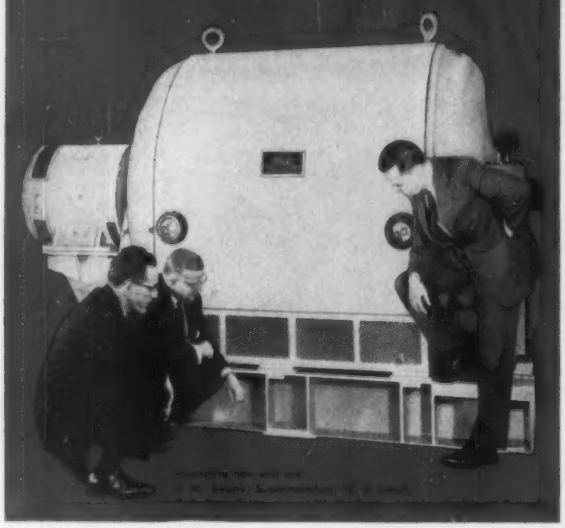
Public Ledger Bldg.
Independence Square
Philadelphia 5, Pa.

Manufacturers of "Sand-Spun" Pipe (centrifugally cast in sand molds)

because

PERFORMANCE

counts



The Hackensack Water Company, Hackensack, New Jersey, like many users of IDEAL equipment, again selects IDEAL equipment on the basis of proven performance.

A new 2000 HP, 720 RPM synchronous motor with control shown at left, duplicates an Ideal unit that has been in operation since 1954.

There are good reasons why progressive commercial and municipal water suppliers—and others who require the utmost in performance and dependability — repeatedly choose Ideal equipment.

For complete details write for bulletin 501

The
IDEAL ELECTRIC
& MANUFACTURING CO.
356 East First St. Mansfield, Ohio

SINCE 1903, AMERICA'S FINEST MOTORS, GENERATORS, MOTOR-GENERATOR SETS, SWITCHGEAR AND CONTROLS

for the proposed consolidated and reorganized cooperative foreign aid programs for underdeveloped areas. Labouisse said a questionnaire has been sent to all ICA mission directors in the field to obtain a country-by-country summary of all existing cooperative programs, as well as information which will be useful in the initial planning for any future program development to be considered.

Aid to South America?

South American countries have been assured by Ambassador Adlai E. Stevenson and the Kennedy Administration that the United States is sincerely interested in helping them to help themselves. A series of overall projects is being blue-printed in those countries. Although each country is different, there are common problems of poverty, disease, illiteracy, poor housing, and high birth rates, as well as the need for land and tax reform.

More rapid social and economic development is imperative in the Latin American states. Ambassador Stevenson said, "While this is a long range undertaking, it is important to demonstrate promptly that we are making progress on this front. We are gratified by the awareness of South American leaders that old molds have to be broken, and that a society which does not translate economic progress into social progress is doomed."

Federal Action in Power and Communication

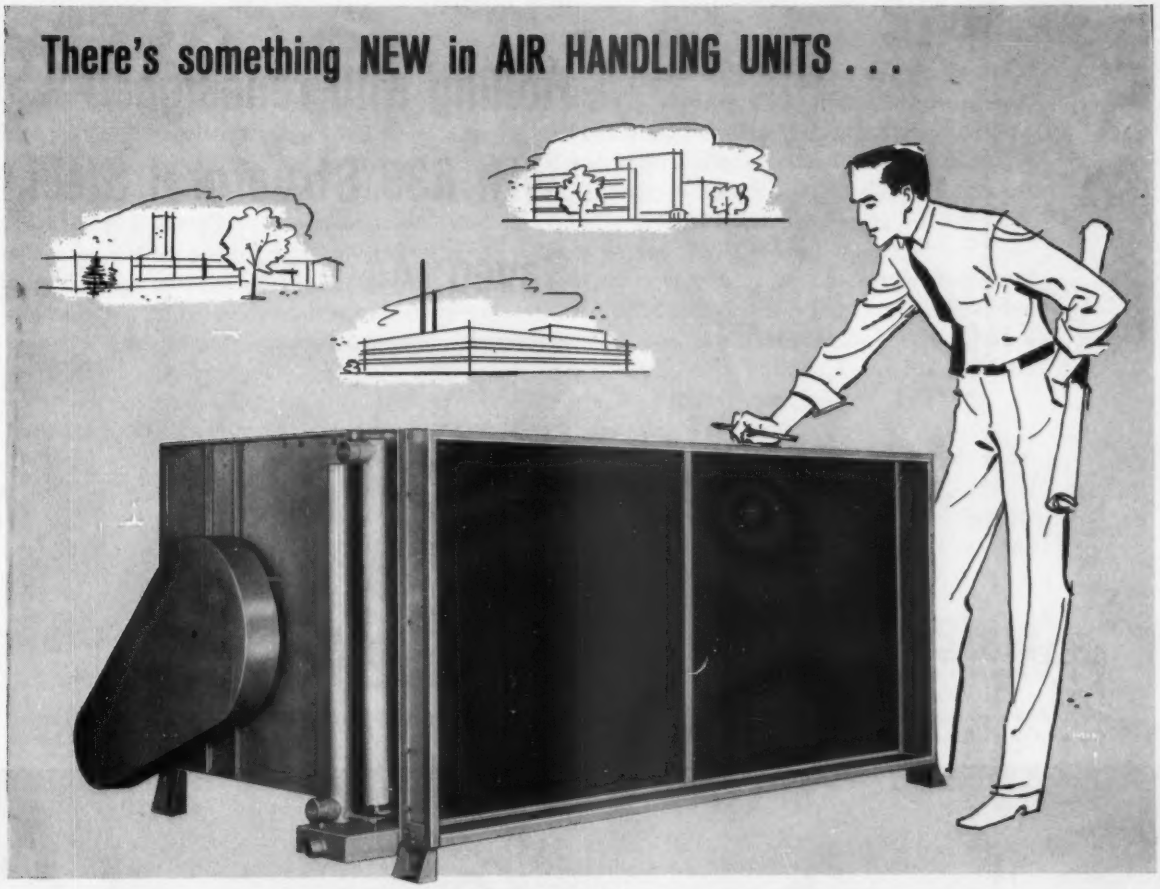
Kenneth Holum, the Department of Interior's assistant secretary for water and power, is presenting the Kennedy Administration's plans for a stepped-up public power expansion program in a series of talks scheduled for scattered areas of the country.

The assistant secretary declares that President Kennedy and Interior Secretary Stewart Udall will supply the leadership for development of nation-wide high voltage, common carrier transmission grid. He said the Federal agencies will play a positive role in this great undertaking.

This will include construction of large tie-in lines between principal Federal power developments. Holum said the proposed 1000-mile Pacific Northwest-Pacific Southwest line from Washington State to Los Angeles would be the first major step in the new program. Said Holum, "The Kennedy Administration believes in resource development, and supports the Federal power system."

Meanwhile, the Federal Space Council is planning to supply an answer to the question of whether a communications satellite system should be owned by the Federal government, private industry, or both. The council, headed by Vice President Johnson, was ordered by the President to study a proposed system which is expected to meet both private and government requirements. ▲▲

There's something NEW in AIR HANDLING UNITS . . .



DUNHAM-BUSH "COMPACTS"

for COOLING • HEATING • HUMIDITY CONTROL

Compact modern design means lower shipping costs, lower installation costs, less required equipment area, more rigid assembly. 26 models are available, vertical or horizontal . . . with an overlapping range of air deliveries from 1000 CFM to 38,400 CFM.

Dunham-Bush Air Handling Units the "compact line" of the industry offers the architect, engineer, and contractor a diversified selection of floor or ceiling mounted central station units. These units are available with direct expansion, water or steam coils . . . or in combinations of these coils.

The Dunham-Bush-engineered flexibility of the component parts assures delivery of air, conditioned to fulfill any seasonal or product demand. Air can be cooled, dehumidified, filtered, heated and dehumidified . . . depending on the requirement.

Accessory equipment available includes mixing boxes, filter sections, face and by-pass dampers for close humidity control, and both water and steam spray humidifiers.

A wide range of air outlet locations and motor arrangements makes Dunham-Bush Air Handling Units easy to specify—easier to install.

For complete information request catalog 6011C

DUNHAM-BUSH

DUNHAM-BUSH, INC.

WEST HARTFORD 10, CONNECTICUT, U. S. A.

SALES OFFICES LOCATED IN PRINCIPAL CITIES

Rolling Mill redesigned with A36 Structural Steel Saved: 44 tons

This mark tells you a product is made of modern, dependable Steel.

The new rolling mill building for Border Steel Rolling Mill, Inc., El Paso, Texas, is 800 feet long, 142 feet wide and 50 feet high. Design, steel fabrication and erection by Ramsey Steel Company, Inc., El Paso, Texas. Mr. W. K. Ramsey, President (left) and Mr. G. W. Ramsey, Chief Engineer.

"We redesigned the rolling mill building for Border Steel Rolling Mill, Inc., to take advantage of the higher strength of A36 Steel. Our original plans were made before the introduction of A36 Steel," said Mr. W. K. Ramsey, president of Ramsey Steel Company, Inc., "and called for 794 tons of A7 Steel. By redesigning with A36 we cut the cost of structural steel almost 10%. In columns and beams alone we saved 44 tons of steel. A36 Steel also saved us $6.00 a ton on shipping charges. At that time, A36 wasn't available in all shapes or we could have saved even more by making the roof trusses of A36 Steel, too."

The building design strength was determined by the 15- and 30-ton overhead cranes and their traveling loads. The building will house a rolling mill and a melt shop in a separate bay. Roof and siding will be corrugated galvanized steel sheets. All fastening was done with high strength bolts. Ramsey Steel Co. erected it in only 30 days.

Investigate the advantages of designing with A36 Structural Steel. Its higher strength can save you money. Delivery is no problem. You can get fast delivery of the complete range of USS Structural Steels from your Steel Service Center. For more information write United States Steel, 525 William Penn Place, Pittsburgh 30, Pennsylvania.

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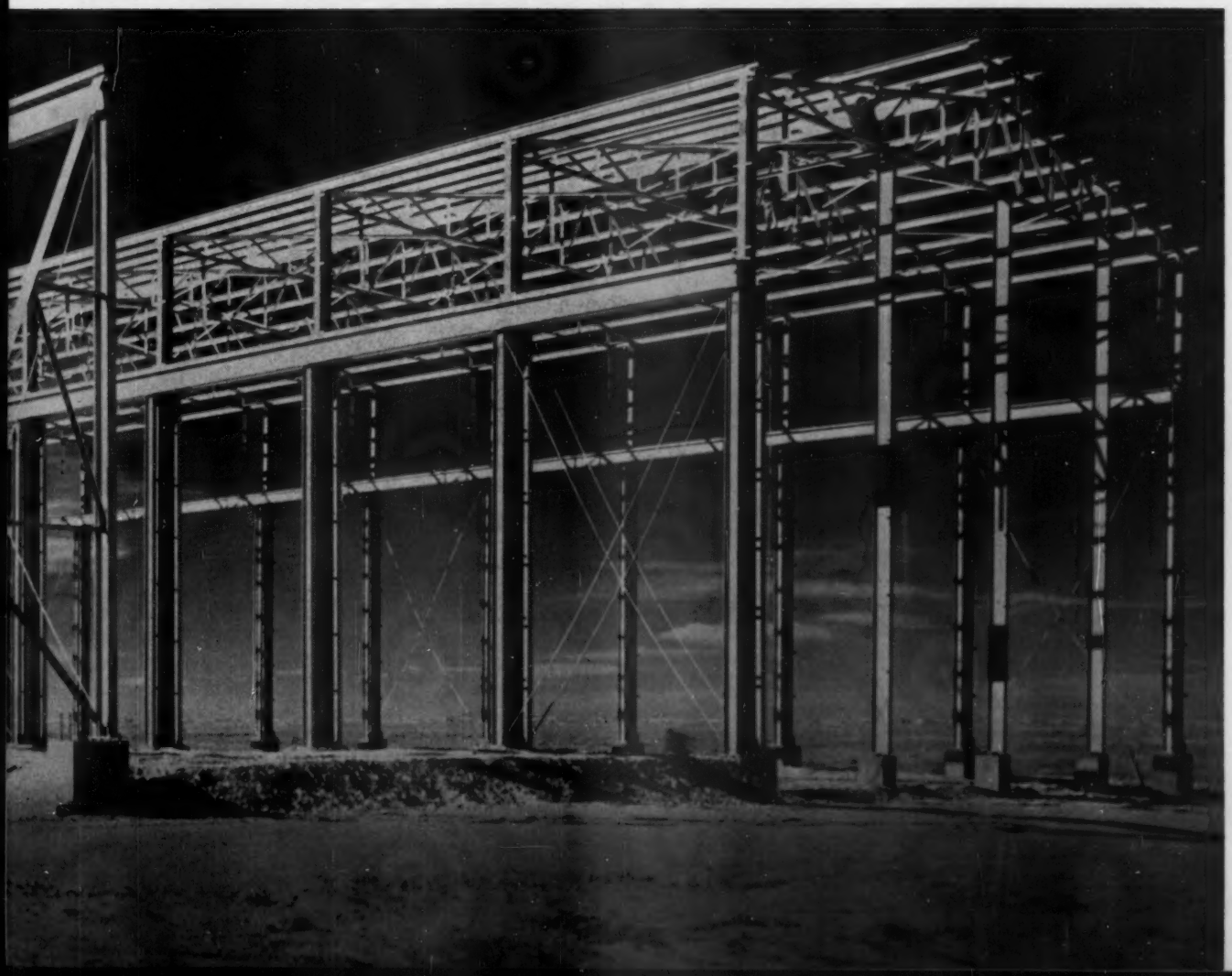
TRADEMARK



ILLCO-WAY DESIGNERS AND BUILDERS
MODERN EQUIPMENT FOR ionXchange

AT 3 PLANTS OF
DETROIT EDISON

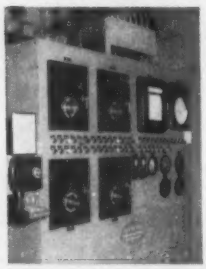
Four IWT installations, the first having been put in 7 years ago, are located in power plants of the Detroit Edison Co., as listed below. The picture at the left shows one of these stations.

RIVER ROUGE POWER PLANT—UNIT NO. 1
Triple Unit Two-Bed De-Ionizers, flow rate 80 gpm *each*, ordered in 1954.

RIVER ROUGE POWER PLANT—UNIT NO. 2
Triple Unit Two-Bed De-Ionizers, flow rate 300 gpm *each*, ordered in 1960.

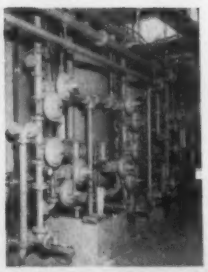
MARYSVILLE POWER PLANT—UNIT NO. 1
Double Unit Two-Bed De-Ionizers, flow rate 170 gpm *each*, ordered in 1957.

DELRAY POWER PLANT—UNIT NO. 2
Double Unit Two-Bed De-Ionizers, flow rate 300 gpm *each*, ordered in 1959.



This picture, taken in the Marysville Power Plant, shows the IWT Control Panel which governs all functions of De-Ionizer regeneration. These control cabinets, which include indicating devices and recording instruments, are designed and built by IWT.

DE-IONIZERS
FOR MAKE-UP WATER



Marysville Power Plant again. This is part of the tanks, piping, power-operated valves, and other elements that are engineered by IWT into a practical, reliable system that delivers high-purity water for high-pressure boiler make-up.

ILLINOIS WATER TREATMENT CO.
840 CEDAR ST., ROCKFORD, ILLINOIS
NEW YORK OFFICE: 141 E. 44th St., New York 17, N.Y.
CANADIAN DIST.: Pumps & Softeners, Ltd., London, Ont.

The High Spots

Personnel Requirements

The Department of Highways of the Province of Ontario, Canada, has issued a paper describing a point evaluation system, for estimating the permanent personnel requirements in a highway department. The system, used by the Ontario department for the past two years, bases staff size on the projected rate of work, and advises the use of private consultants whenever the work load exceeds the capacity of the basic staff. The paper also outlines the success the Ontario department has had with this system, and explains its potential for other phases of engineering work.

High School Counseling

D.W. Klar, of the consulting firm of Wilsey, Ham & Blair, is one of several San Francisco-area engineers who are doing voluntary guidance work in local high schools. The program of counseling, set up by the Peninsula Chapter of the California Society of Professional Engineers, is designed to show high school students the advantages of a career in engineering.

Library Aid

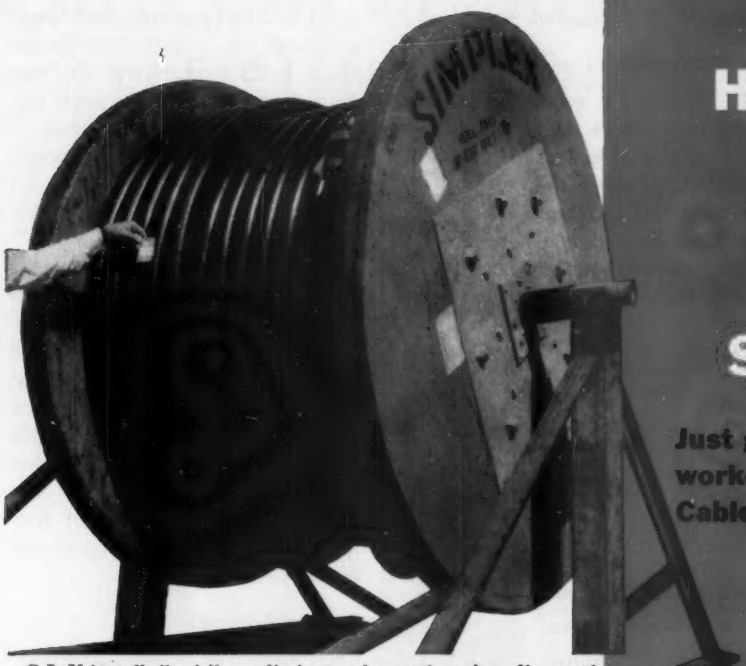
The Special Libraries Association has published *A Checklist for the Organization, Operation, and Evaluation of a Company Library*, designed to help management with the planning or reorganizing of a company library. While the book is intended primarily for large industrial organizations, it could also be of value in establishing a professional library in a medium or large size engineering office. The book, and other information on organization libraries, is available from SLA, 31 East 10th Street, New York 3, New York.

Construction Brochure

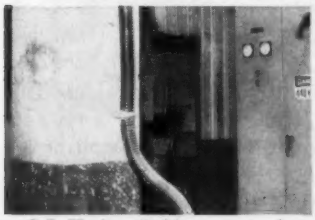
The General Building Contractors Association, Inc., has put out a small but very well planned brochure, called the *foundation of growth: CONSTRUCTION*. The booklet sketches the development and growth of the building industry, and how it has related to the growth of the country. Although the emphasis is on the construction phase of building, and there is no reference to the functions of engineer or architect, the brochure is an example of the effective public relations material that could be produced by these professions.

Chicago Committee

The Chicago Association of Consulting Engineers has established a committee to aid public bureaus in local communities with inspection of the design and installation of plumbing, heating, ventilating, electrical, sanitary,



C-L-X installs "as is" . . . eliminates the cutting, threading, and pulling operations necessary with conventional duct or conduit.

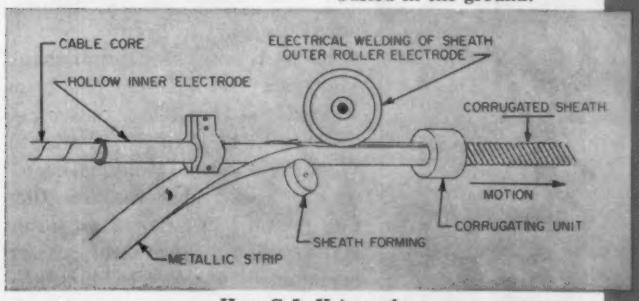


C-L-X is pliable . . . can be handled smoothly on a standard size reel.

C-L-X is easily trained anywhere, in continuous, long-length runs.

C-L-X installs without the need for benders, sand, elbows, or similar fittings.

C-L-X is versatile. It can be installed with clamps, in trays or ladders, or directly buried in the ground.



How C-L-X is made.

HOW MUCH MONEY COULD C-L-X SAVE YOU?

Just glance at these time-and-work-saving features of C-L-X Cable Systems by SIMPLEX.

You'll see how easily this packaged *combination* of cable and pliable, impervious metallic sheath installs. You'll see why it cuts installation cost to a fraction of that required for conventional cable and duct. Then *find out* how much money today's easiest-to-install cable system can save you.

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and structural work. The committee will assist with technical advice on code revisions, modernization, and inspections, and will provide expert witnesses for court actions.

At present, the committee is saddled with one of the longest names in the profession — The Chicago Association of Consulting Engineers Committee for the Study and Re-Examination of Better and Safer Construction Methods for Protection of Public Health, Welfare, and Safety.

AIA Promotion

The Detroit Chapter of the American Institute of Architects is taking to the airwaves to show the public the importance of architecture and architects. The group will produce a half-hour weekly show Saturday evenings on WQRS in Detroit, presenting news of recent developments in building design. In addition, a special guest will be presented each week, to speak on architecture or an allied field. Producers of the program hope to make it varied and informative enough to attract a wide audience of both professionals and layment.

New Steel Pipe Spec

A new Federal specification has been issued for cement mortar lined and reinforced mortar coated steel pressure pipe. The lined and coated pipe is said to be superior to other types in several respects. It is available in lengths up to 48 feet, from 4 to 42 inches in diameter. The new pipe was developed by the Bureau of Reclamation of the U. S. Department of the Interior.

Ban on Concrete?

Crest Concrete Systems, a manufacturer of precast concrete components, has filed suit in Cook County Circuit Court, charging the City of Chicago with arbitrary refusal to use their product. The suit, filed against the city and against Building Commissioner George Ramsey, charges that Ramsey has warned architects and engineers against specifying prestressed concrete in Chicago buildings, even though the prestressed concrete meets all the requirements of the city building code. Crest has asked for an injunction restraining Ramsey from arbitrary refusal to use prestressed concrete.

Michigan Reactor

The Supreme Court has upheld the Atomic Energy Commission and a group of electric utilities, on AEC's right to license a development reactor in Birmingham, Michigan. The licensing had been opposed by three large unions — the Electrical Workers, the Auto Workers, and the Papermakers — who protested that the construction permit was granted on insufficient safety assurances. They complained specifically that the

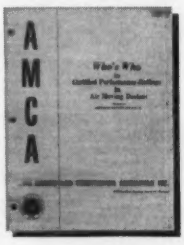
Who's Who

The first edition of "Who's Who in Certified Performance Ratings" is now available to users and specifiers of air moving equipment. This new publication of the Air Moving and Conditioning Association meets the recognized need for an official directory of manufacturers and products licensed by AMCA to use the Certified Ratings Seal.

in Certified

The 54-page directory contains essential product identification data on all air moving devices which have been tested and rated for performance in accordance with the rigid requirements of the AMCA Certified Ratings Program. Revised issues will be published periodically.

Copies of Bulletin 261A, "Who's Who in Certified Performance Ratings" are available from: Air Moving and Conditioning Association, Inc., 2159 Guardian Building, Detroit 26, Michigan.



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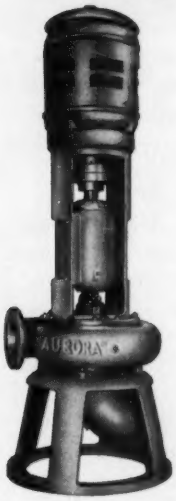

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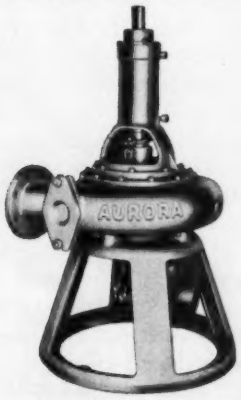
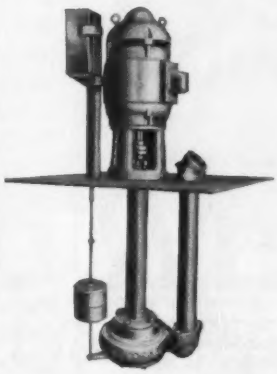
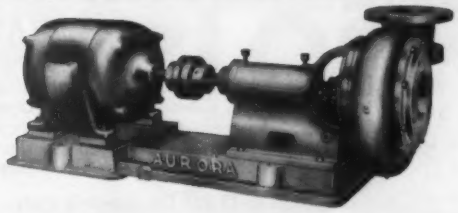


TYPE KU VERTICAL—For flexible shaft drive...misalignment proof ...elevated motor protection against pit flooding.



TYPE KS VERTICAL—For heavy duty wet pit service. Complete unit engineered to specific pit requirements.



TYPE KGG HORIZONTAL—Rugged base mounted unit ...for use where suction conditions permit horizontal mounting.

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reactor would be located too close to heavily populated regions.

Adolph J. Ackerman, a consulting engineer of Madison, Wisconsin, was granted leave to file a brief in the case *amicus curiae*. In his brief, Ackerman declared that the selection of the site for a nuclear reactor was not governed by rules of law, but by the application of engineering judgment. He charged that, in the Birmingham case, the principles of responsibility of the engineering profession were not observed, and that the choice of this location was the result of a denial of professional freedom.

Legal "Wire-Tapping"

Technically, wire-tapping is the recording of or listening in on a telephone conversation by a third person who is unauthorized or undesired by both parties. However, it is perfectly legal to record a conversation if both parties are aware of the recording and consent to it.

This legal recording of telephone conversations could prove particularly helpful to engineers, the best of whom are apt to forget the fine points of an involved technical conversation. The Supreme Court has ruled that the traditional beep-tone (1/5 of a second at 1400 cps, every 15 seconds) is not necessary when recording a telephone conversation. Therefore, all that is needed is a tape recorder or an office dictating machine and a readily-available induction pick-up.

Instant Salt Water

Disturbingly large sections of the world are faced with serious shortages of fresh water. One of the most promising solutions to the problem is the conversion of salt water from the ocean, if it can be done cheaply enough. Douglas Cox, of Durban, South Africa, may have the answer.

Cox runs what is probably the only desalinization plant in the world which discards the water and saves the salt. His company packages the salt and ships it inland to regions inhabited by the Bantu. Since the early 19th century the Bantu have regarded plain sea water as a healant, efficacious in treating everything from dispepsia to despondency. Since the cost of transporting sea water inland has proved prohibitive, Cox stumbled on the idea of dehydrating it and selling the salts. He is reported to be doing so well with this venture that he is planning to branch out and start peddling dehydrated beer.

If enough other peoples of the world could be convinced of the therapeutic value of sea water, a substantial market would be built up for the sale of dehydrated salt water. The profits from this venture might well bring the cost of desalted water down to a practicable level. ▲▲

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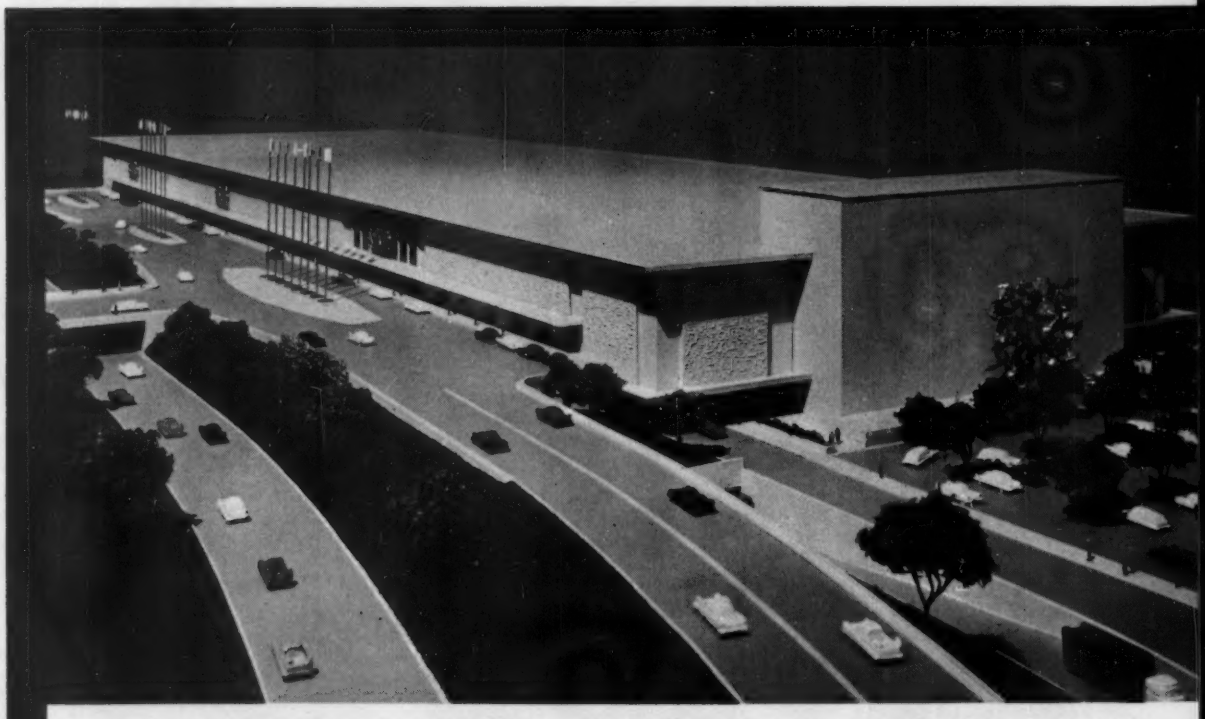
- Dur-O-wal Prod., Inc., 4500 E. Lombard St., BALTIMORE, MD.
- Dur-O-wal of Ill., 260 S. Highland Ave., AURORA, ILL.
- Dur-O-wal Prod. of Ala., Inc., Box 5446, BIRMINGHAM, ALA.
- Dur-O-wal of Colorado, 29th and Court St., PUEBLO, COLO.
- Dur-O-wal Inc., 1678 Norwood Ave., TOLEDO, OHIO
- Dur-O-wal Ltd., 789 Woodward Avenue, HAMILTON, ONTARIO, CANADA

Strength with flexibility—the two basic factors for a repair-free masonry wall are assured by these intelligently engineered companion products. Dur-o-wal reinforcement, top left, increases flexural strength 71 to 261 per cent, depending on weight Dur-o-wal, number of courses, type of mortar. The ready-made neoprene Rapid Control Joint, beneath, flexes with the wall, keeps itself sealed tight.

SUPER-QUIET WESTINGHOUSE TRANSFORMERS SLASH INSTALLATION COSTS BY $2163 AT CHICAGO EXPOSITION CENTER



Chicago's new Exposition Center, shown in scale model, provides a 70,000-foot main exhibition hall and complete facilities for holding big conventions, trade shows and fairs. Installation of 65 super-quiet Westinghouse dry-type transformers assures an available total power supply of 16,000 kva and reduces objectionable noise.

At Chicago's new Metropolitan Fair and Exposition Center in Burnham Park, extremely low sound levels were set for the transformers, ranging from 34 decibels on 9-kva units to 42 decibels on 300-kva units. Extensive tests both at the factory and on location show the sound of Westinghouse DS-3 and DT-3 dry-type transformers substantially below these levels.

The compact Westinghouse dry-type transformers were installed on trapeze platforms suspended from the ceiling at considerable savings. Trapeze locations were spotted in advance and ceiling rods preset before pouring concrete. The lightweight Westinghouse transformers were then quickly raised into place as complete units by a two-man crew without extensive rigging equipment. Cost estimates show that, because the transformers came with premounted circuit breakers, installation time on each unit was cut by eight hours. Total installation savings: about $2163.

When the entire 70,000-foot main exhibition level is in use — or when any portion of it is used — the power supply is completely adequate. Some eighteen 225-kva Westinghouse transformers serve this main hall; others are used in lecture, meeting and conference rooms, dining areas, the garage, and storage rooms.

Westinghouse dry-type transformers can meet your requirements . . . and save you money. For more information, contact your nearby Westinghouse representative, or write Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania.

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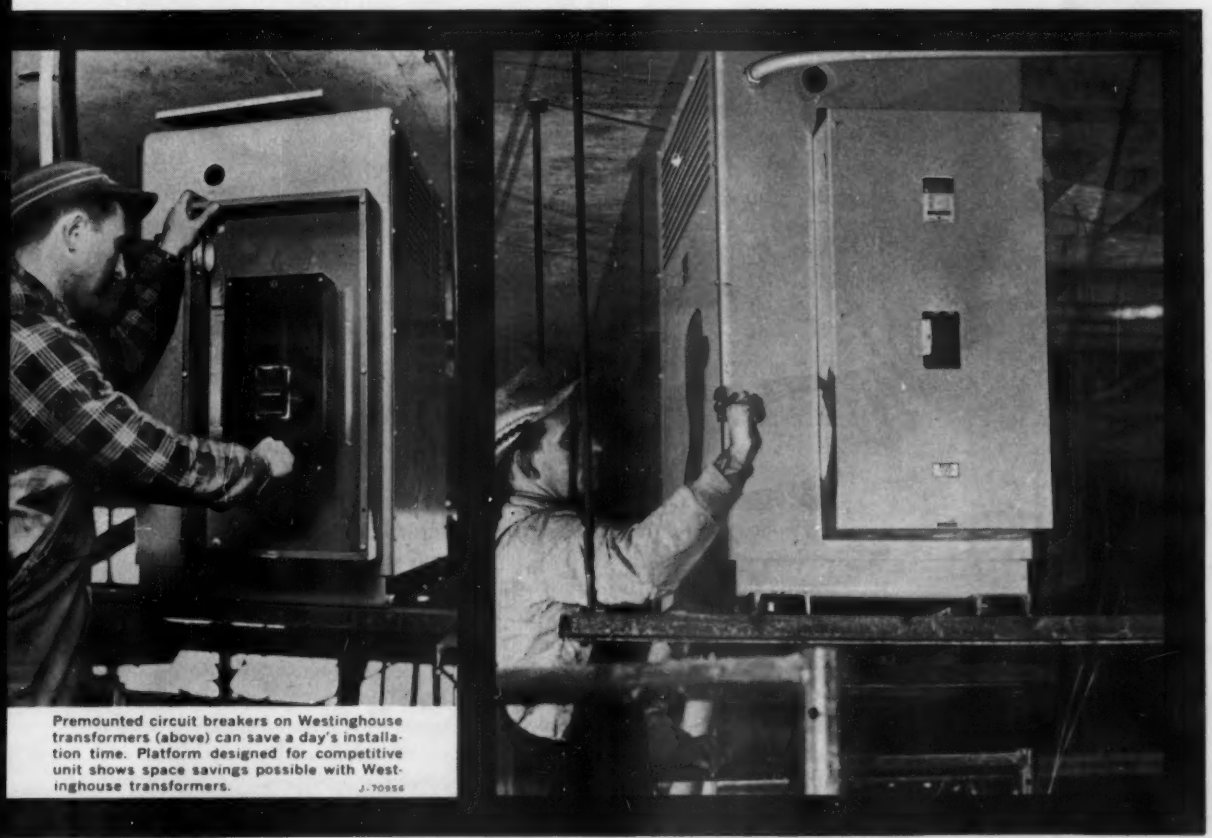

Premounted circuit breakers on Westinghouse transformers (above) can save a day's installation time. Platform designed for competitive unit shows space savings possible with Westinghouse transformers. J-70956

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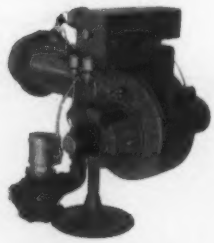

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FIDIC General Assembly Meeting

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THE ANNUAL meeting of the General Assembly of the International Federation of Consulting Engineers (FIDIC) was held in Zurich, Switzerland, May 23-26, 1961. For the first time in many years, all 15 national member associations were represented at the meeting. These member associations are Australia, Belgium, Canada, Denmark, Finland, France, Germany, Great Britain, Ireland, The Netherlands, Norway, South Africa, Sweden, Switzerland, and the United States. With the wives and additional visitors from the Swiss Association, there were nearly 150 in attendance at the annual banquet, which was held Wednesday, May 24.

Discussion Topics

Subjects considered in the general meeting included matters of importance to consulting engineering practice in many countries:

¶ Relationships of consulting engineers with the European Free Trade Association and with the European Economic Community

¶ Relationships between consulting engineers and NATO

¶ Procedures for handling requests from underdeveloped countries for advice concerning the capabilities and qualifications of consulting engineers for various projects

¶ Policies of public relations for the consulting engineering profession and policies concerning advertising by consulting engineers. The following declaration of Policy was adopted unanimously for a trial period of one year, so that the next general assembly meeting could deal with any comments: "Corporate advertising, which is recommended as necessary in the best interest of the profession, may be supplemented by individual advertising in appropriate cases as judged by the national association concerned. Any brochure or other form of advertisement must be dignified and factual. To ensure this the issue should comply with the criteria established by the association to which the individual member belongs."

¶ Development of the recommended International Form of Agreement between Client and Consulting Engineer. A draft of this document has been submitted to the member associations for comment.

¶ Extension of the International Conditions of Contract for Works of Civil Engineering Construction. The trial period for this document, agreed to by FIDIC and the International Federation of Contractors in 1957, was extended to 1962.

¶ Selection of Helsinki, Finland, for the 1962 annual meeting. It was also noted that the 50th anniversary of FIDIC will occur in 1963, and it is planned that appropriate recognition of this anniversary will be a part of the 1963 annual meeting program.

¶ Application was received from a consulting engineering group in New Zealand, as well as applications for correspondents from Greece and South Vietnam.

An important by-product of the conference was the chance for informal talks during the excursions and special functions. This permitted ample opportunity for free discussion among all of the delegates and observers in attendance. One of these functions was a half-day boat trip around Lake Zurich. The committee had arranged beautiful weather, so that before, during, and after the serious discussion of pro-

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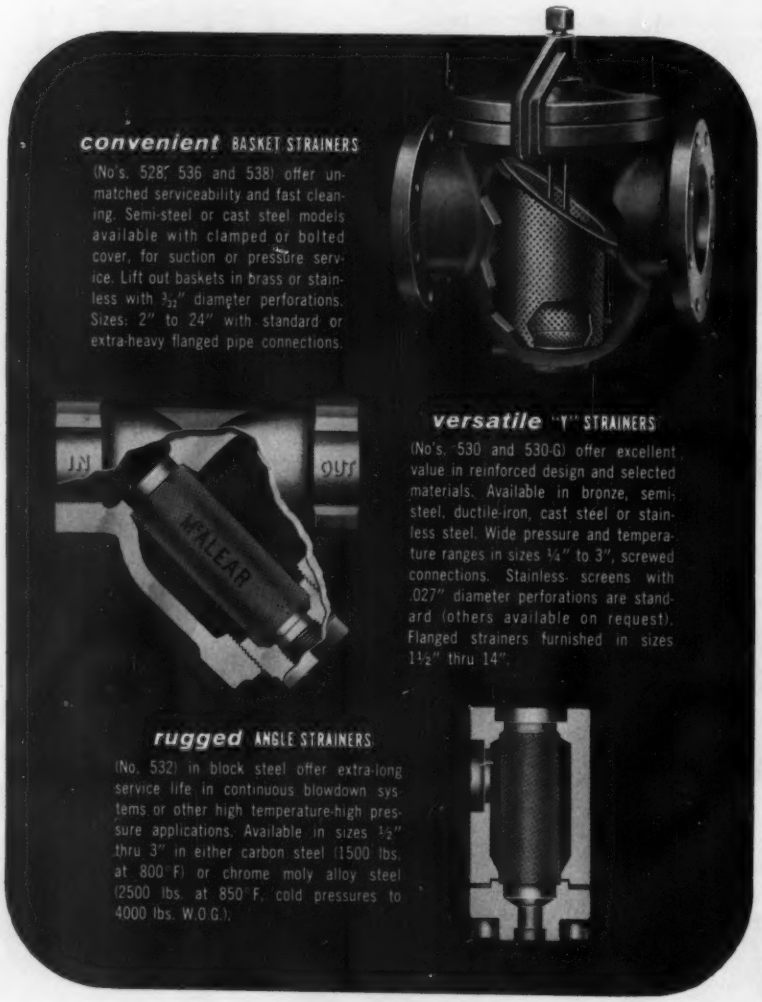

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(No. 532) in block steel offer extra-long service life in continuous blowdown systems or other high temperature-high pressure applications. Available in sizes ½" thru 3" in either carbon steel (1500 lbs. at 800°F) or chrome moly alloy steel (2500 lbs. at 850°F, cold pressures to 4000 lbs. W.O.G.).

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fessional matters, large quantities of photographic film were exposed to the picturesque Swiss villages around the Lake, and the snow-capped Alps in the background.

Engineers' Problems

In the discussions among the delegates and observers, it was evident that all of the national associations face very similar, if not identical, problems concerning both their internal functions and external relationships. All associations felt the need for encouraging greater participation in association affairs among a larger number of their membership.

In the area of relationships between the consulting engineers and other segments of the economy, there seems to be almost universal concern over the tendency to develop increasingly larger governmental agencies and bureaus which undertake to render engineering services. There also was some discussion of the possibility of consulting engineers working for general contractors, as their clients, to provide combined engineering and construction services when the needs of a particular client's project indicate such combined services to be desirable. It was noted, particularly by some of the British representatives, that there is a growing tendency among responsible contractors to recommend the use of consulting engineers. Some contractors find that the services of consulting engineers relieve them of pressure to furnish preliminary engineering services when a client is either unwilling or unable to pay adequate fees for the rendering of such services. Also, some contractors find that the maintenance of a competent and well balanced engineering staff involves financial burdens which can be eliminated by the appropriate use of consulting engineers.

It appears that there is a world-wide need for an improved and more effective public relations activity which will convey the story

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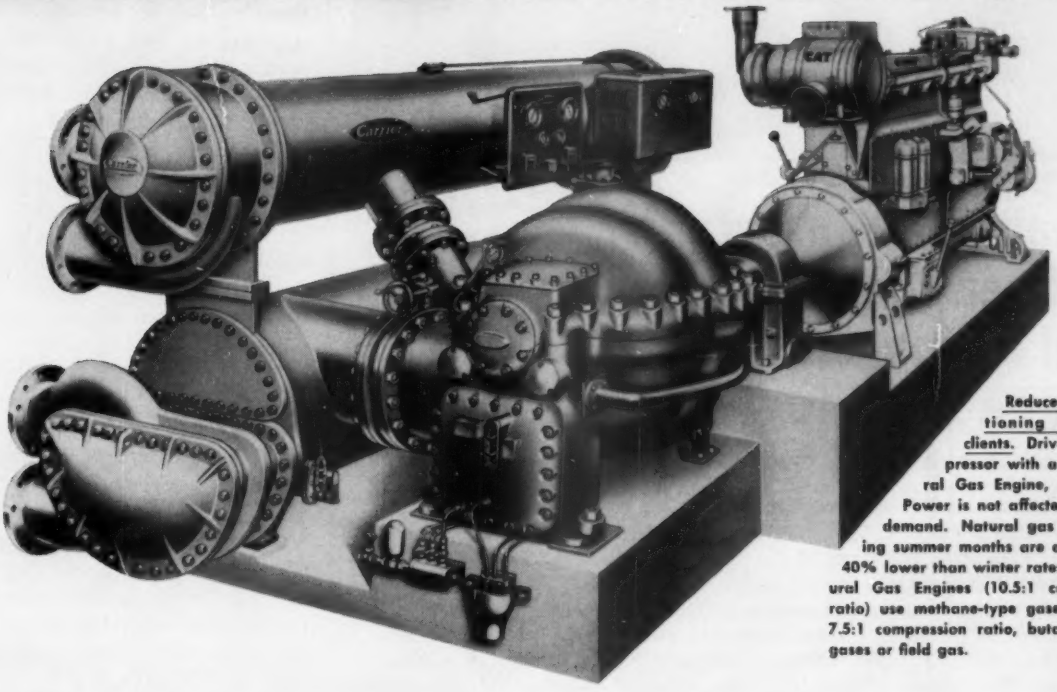
HAVE YOU CONSIDERED THIS UNUSUAL APPROACH TO LOWERED AIR CONDITIONING BILLS?



Reduce air conditioning costs for clients. Drive the compressor with a Cat Natural Gas Engine, as shown. Power is not affected by peak demand. Natural gas rates during summer months are as much as 40% lower than winter rates. Cat Natural Gas Engines (10.5:1 compression ratio) use methane-type gases or, with 7.5:1 compression ratio, butane, mixed gases or field gas.

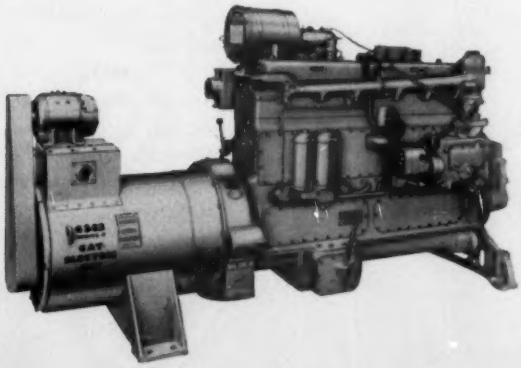
When you design or install air conditioning for commercial buildings around a Caterpillar Natural Gas Engine, you can insure clients materially lower operating costs.

Cat Natural Gas Engines often pay for themselves in only a few seasons. Calculations show that a Cat G342 can power a centrifugal compressor for less than ½¢ per ton hour, based on a natural gas rate of 60¢/MCF. This includes fuel, engine depreciation, and maintenance.

Cat Natural Gas Engines operate up to 30,000 hours before major overhaul—or about 10 years of air conditioning service. Furthermore, Cat Natural Gas Engines do not have to be derated because they are built on a basic diesel frame—with all the diesel strength intact. With some types of natural gas engines, it is necessary to reduce output in order to achieve reasonable life.

The Cat Natural Gas Engine is as easily maintained as a Cat Diesel. No special technical training is needed. Caterpillar Dealers located throughout the country insure that parts and service will be available for the life of the engine.

If your clients are seeking every opportunity to reduce costs, we urge you to investigate the Cat Natural Gas Engine for air conditioning. Write to us direct, call your Caterpillar Dealer, or talk with air conditioning equipment manufacturers.



The Cat Turbocharged-Aftercooled G342 Natural Gas Engine produces 280 continuous HP @ 1200 RPM in the 10.5:1 compression ratio and 235 continuous HP @ 1000 RPM in the 7.5:1 compression ratio. The six-cylinder, four-cycle G342 Natural Gas Engine utilizes a low-tension ignition system. The electric set shown here produces 175 KW continuous or 200 KW on an emergency basis.

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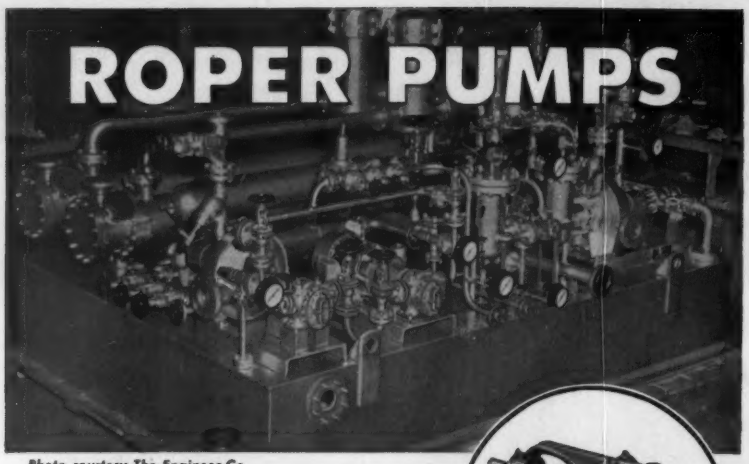

Photo courtesy The Engineer Co.

maintain lubrication of seals and oil bearings on large centrifugal compressor

• CAPACITY RANGE: 5-75 GPM • OPERATING PRESSURES: TO 1000 PSI

The complex lube system for this centrifugal compressor was designed by The Engineer Co. for the Elliott Co. and Blaw-Knox for Ashland Oil Co., using two types of Roper pumps as booster and main lube units. The Fig. 1H15 booster pumps handle 70 SSU viscosity SAE-10 lube oil at operating temperatures of 140°F, and deliver up to 17 gpm at 475 psi pressure. The two main lube pumps are specially modified Roper Series K units handling 76 gpm at 50 psi. Close cooperation with The Engineer Co. by Roper determined the pumps which would best serve the needs of this lubricating system. Special problems involving pump components for your equipment will receive this same skilled assistance by Roper engineers.

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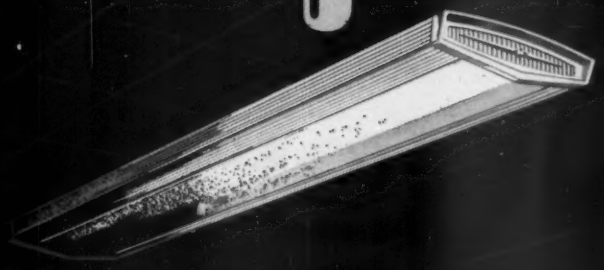
of the consulting engineer and the significance of his services in the economic community. Some delegates pointed out that clients often are not appreciative of the many delicate, and often critical, decisions which must be made in the course of the design and construction of a project. There may be varying degrees of conflict between the cost and expediency of construction on the one hand, and economy, continuity, dependability, and adaptability of the completed facility during its planned period of service on the other. It was mentioned by several delegates that the importance of this feature of the consulting engineer's services should be explained and conveyed to those agencies who have responsibility for the development of engineering projects.

Personal Contact

The informal discussions among the delegates brought out the importance of personal contact between engineers practicing in different countries and different parts of the world. There are repeated and continued difficulties in attaining a full understanding of the problems and practices encountered in different locations. Apparently this can best be accomplished by personal contact between individuals. Although attempts should and are being made to achieve understanding between differing points of view by corespondence, there apears to be no substitute for the opportunity of a free, personal discussion between individuals representing different local practices and customs. The United States should do everything possible to encourage attendance and participation in FIDIC meetings. It is a rewarding experience.

The Swiss Society of Consulting Engineers, "Association Suisse des Ingenieurs-Conseils," was warmly congratulated for its hospitality. Arrangements for both the formal and informal sessions of the program were very well planned. ▲▲

BENJAMIN



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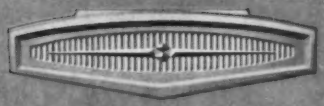

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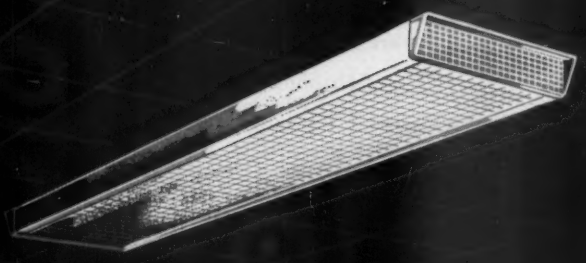

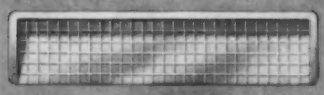

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DRIBBLE is bouncing the idea around. "We can't air-condition this school; maybe the next one!"

Only a few years ago we asked: "Are we ready to air-condition our schools?"

Then came Sputnik—and examination of our educational system. Shortcomings of the present were blamed on teaching of the past. Demands of the future were portrayed by frightening statistics. *Quality* and *quantity* became important educational yardsticks.

Many new curriculums, methods, tools, and schedules are being proposed to improve *teaching*. Conditions that improve *learning* deserve equal attention.

Fribble, Quibble, and Dribble

There is a classroom thermal comfort most conducive to learning. Good schools have sought to maintain it with a unit ventilator in every room. It heats the room for occupancy — after which it fights heat from the pupils, the lights, and the sun all day long, introducing enough fresh air for continuous ventilation and enough more to prevent the accumulation of enervating heat. But when outdoor air is not cool enough to offset the heat gains, *refrigerated* air is required. This condition exists in most schools in spring and fall—and in all of them in summer. Mechanical cooling is needed *now* in schools intent on achieving excellence. It will be needed in all schools in the years ahead.

Time for Action

An educational revolution is under way. Changing patterns demand flexible schools. Learning spaces—whatever their size—need a *year-round* thermal environment under unitary control. The facility is an economic necessity based on *productivity*.

Challenge to the Planners

Schools should be designed to meet new educational needs—including air conditioning on its merits. Some schools may cost less with air conditioning than others without it; but architecture should not be weighted by this requirement. The goal is the pupil's learning efficiency.

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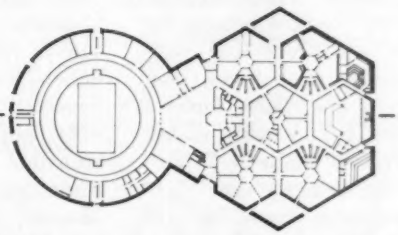
Air-conditioning schools is a specialized field. Manufacturing equipment to serve for the life of a school calls for a proven ability. Look back over the record of the past 44 years—in thousands of classrooms—and you will confidently look ahead with Nesbitt.

POSITIVE THINKING ABOUT SCHOOL AIR CONDITIONING

Changing educational patterns demand flexible schools with learning spaces equipped for year-round air conditioning under unitary control—as an economic necessity based upon educational productivity for the life of the building.



McPherson goes Nesbitt!

This new high school for McPherson, Kansas, is a good example of a building designed to meet modern educational specifications —including audio-visual and team teaching methods and year-round air conditioning. Total cost (with furniture and kitchen equipment), $11.79 per sq. ft.—of which $2.35 is for plumbing, heating, and air conditioning. Average cost of 22 non-air-conditioned high schools in the same area, $13.90 per sq. ft.—Architects and Engineers, Shaver & Co., Salina, Kansas.

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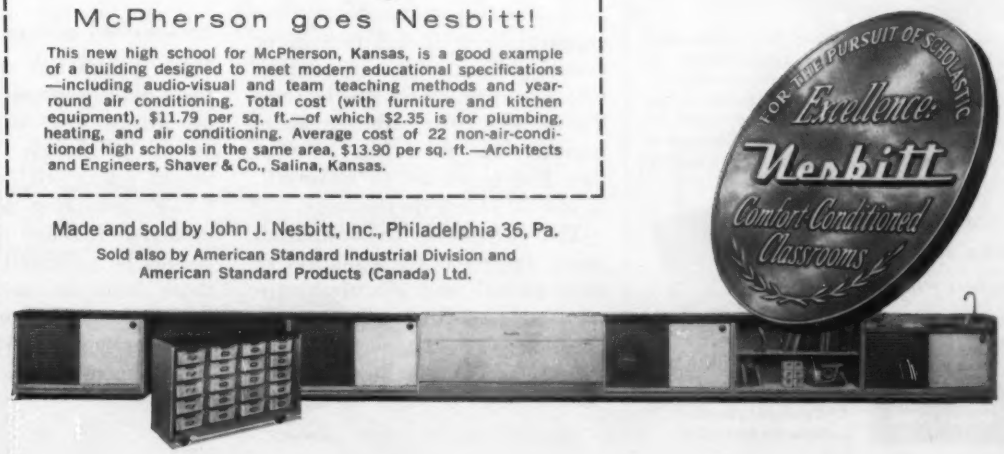

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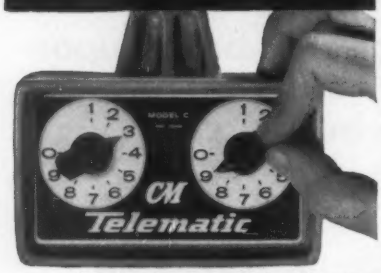

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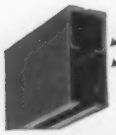

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A Report from the West Coast

FRANCIS E. ADAMS
Consulting Engineer

Mechanical-Electrical Fees

IT IS HIGH TIME that suitable and realistic recommended fee schedules for mechanical and electrical consulting engineers throughout California be developed and recognized as appropriate standards by the design professions. The present questionable criteria of general custom is archaic, and is creating real financial chaos.

There is a general impression that in Northern California there is a standard fee of 4 percent for mechanical and electrical engineering design in building construction. At the same time, a standard fee of 5 percent is understood to exist in Southern California — for the same services.

Some engineers know by cost analysis and consideration of the economic facts that 4 percent or even 5 percent often will not provide a satisfactory fee for the services required. Accordingly, these engineers set their fees at what they find is needed to make out, or else let others do the work.

The increasing responsibilities which fall upon the shoulders of mechanical and electrical consultants, plus the greater complexities of design requirements, indicate clearly the need for increased fees. This is particularly true for the mechanical engineer dealing with complex problems of air conditioning.

We M-E consulting engineers can blame ourselves, our predecessors, and our contemporaries, for these out-of-date standards and poor business practices. It is up to us to take the corrective action necessary. Some 10 to 15 years ago, structural engineers in California decided to get out of a similar rut. After careful consideration, they set up standards for structural fees which today provide reasonable compensation for structural services rendered. M-E consulting engineers should do likewise, and soon.

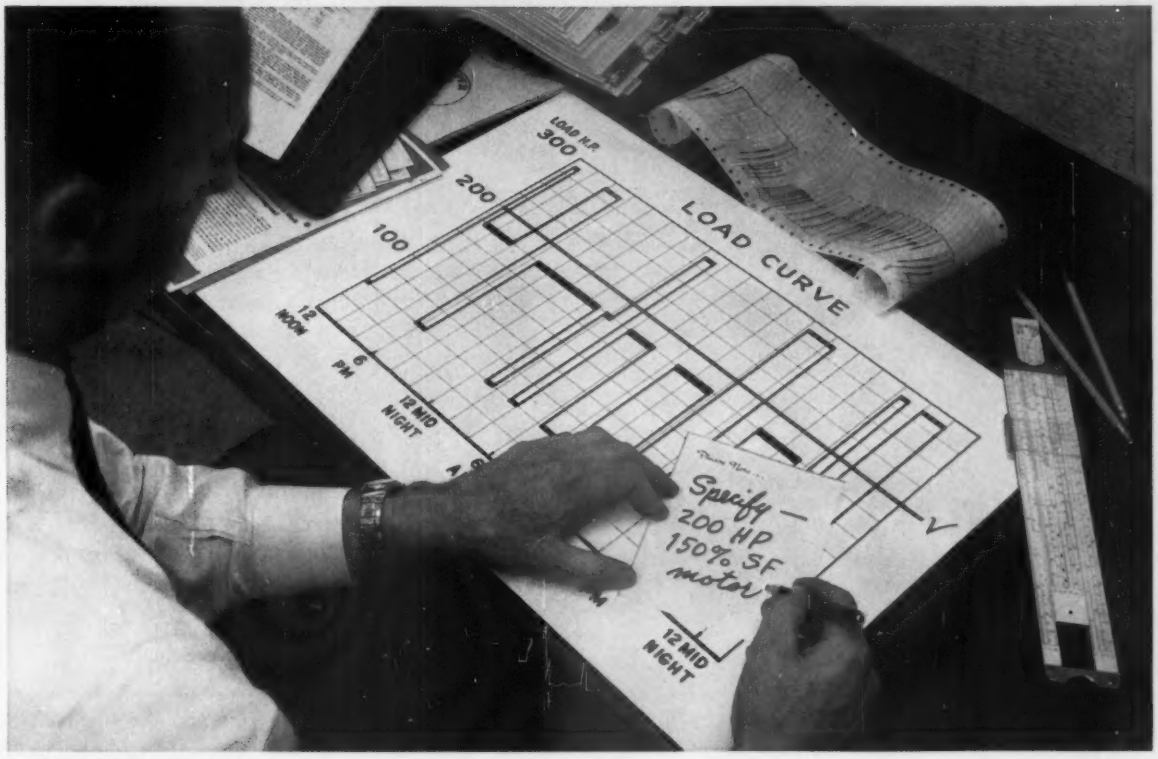
Establishing a Basis

What parameters should be applied to the question of proper and adequate M-E consulting fees? In my estimation, the following would get us well started:

¶ M-E consulting services to be rendered for any given project should be indicated clearly, with those items to be provided by others than the consulting engineer clearly noted. These specifications recently have been cata-

SILICONE NEWS from Dow Corning

Over-motoring Out-moded



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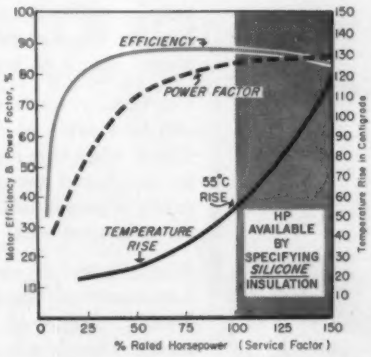
Additional savings in several ways: additional nameplate horsepower is usually more expensive than the extra service factor silicone insulation provides; additional horsepower requires extra floor space and heavier mountings; over-motoring power factor problems are eliminated or minimized.



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logued by the M-E engineers of the San Francisco Bay Area. (See CEAC Discussion Paper 355 PRT 006 "Outline of Services," February 20, 1961.)

¶ Appropriate written contracts regarding these consulting services should be entered into by the consulting engineer and his client. The new CEC contract forms are a forward step.

¶ Each design project should produce fees which fully cover the cost of engineering payroll, provide for overhead costs, and produce a profit for the engineering firm. Each project should carry its own weight.

¶ Engineering design services vary in complexity and precision requirements. Fees on any basis should vary similarly.

¶ Alteration work demands higher fees than new construction.

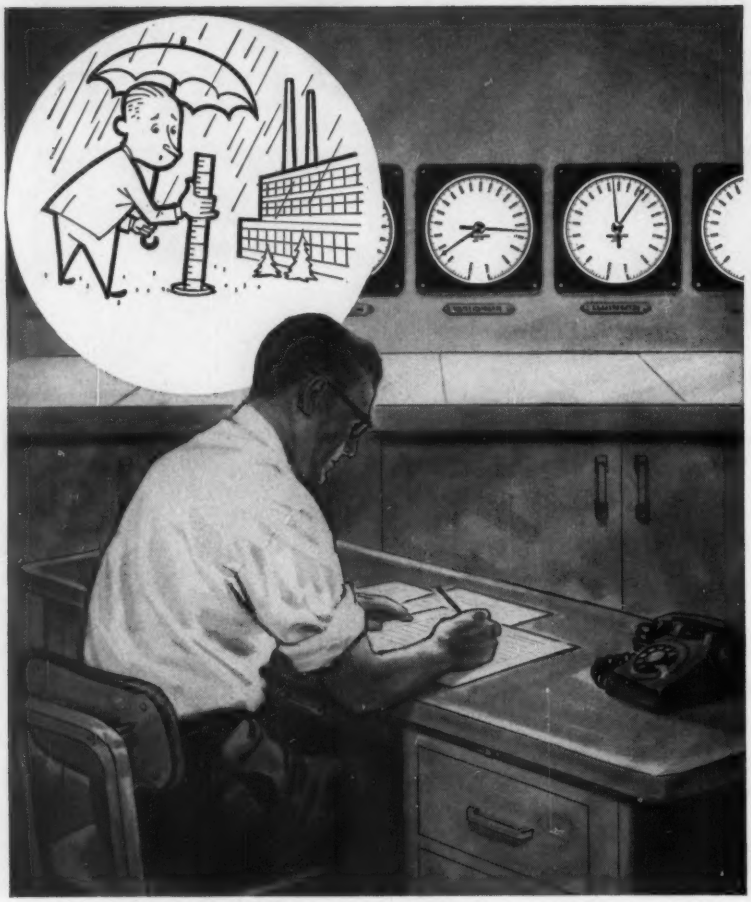
¶ Multiple use of a given design often can involve reduction of average fee.

Building a Fee Schedule

Now let us consider in greater detail the question of fees for M-E work in connection with building construction. In most cases, the M-E consultant is a member of the design team, while acting as a design sub-contractor under an architect or structural engineer who has arranged with the owner for complete design services.

The project will deal with new construction, remodeling, or both. To accomplish a given end, the design costs for remodeling are greater than those for new construction, and should provide for greater fees both percentage- and dollar-wise. In general, a 30-50 percent increase should be applied to remodeling work for digging out unrecorded data, fighting the project into and around existing structures, and modifying existing installations.

While a time and material basis of setting fees would generally be fair to all, the engineer's clients are often reluctant, except in a



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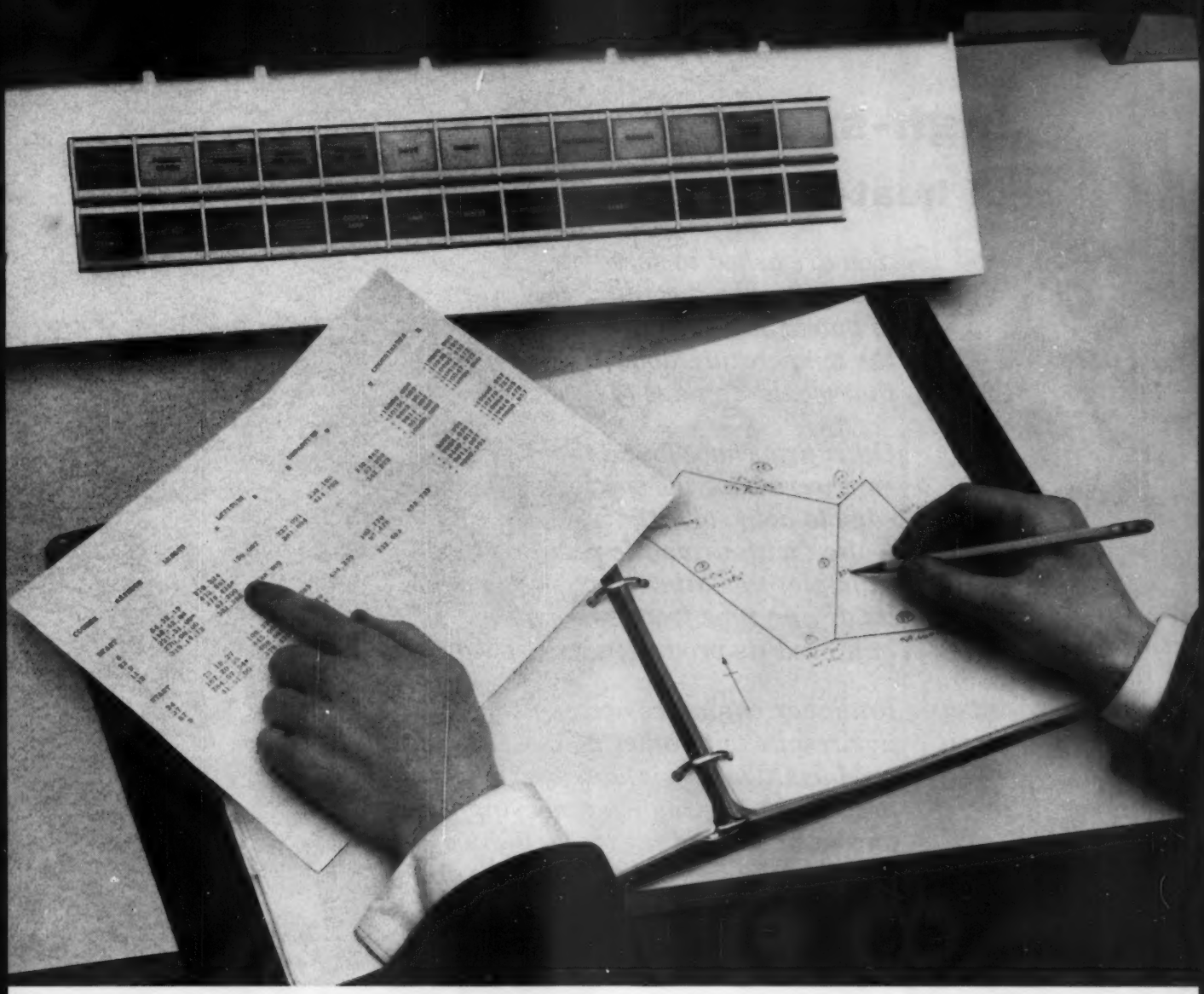

A time-saving package for the subdivision engineer... the IBM 1620 traverse closure and curve data program

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The program actually consists of two programs—*traverse closure program* and a *lot and general curve data program* incorporating the same subroutines. The traverse program will accommodate thirty-sided traverses. It will automatically select the proper method of computing the missing bearing(s) and distance(s) from among the five possible end solutions. For each course it prints out the course number, bearing, distance, end coordinates, and the traverse area in square feet and acres.

The program is flexible—you may use typewriter or paper tape input—you can decide whether the program is to report bearing and angles in tenths of seconds or seconds.

And, you'll find that the 1620 is easy to use, fast and powerful. It's the most outstanding engineering and scientific computer in its price range. A basic installation rents for just $1600 a month.

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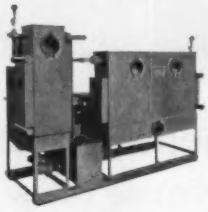

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limited way, to utilize this method. Even so, this seems to be the practical solution for projects which involve construction costs up to about $40,000. Above this amount a percentage fee seems to be a generally practical solution.

The type of services provided indicates another variable. Let us assume that the M-E consultant is to provide the usual basic services, including general preliminary design considerations, design development details, working plans and specifications, and periodic construction inspection.

The desirable percentage rate must vary with cost of construction, with complexity of design problem, and with extent of alteration involvement. For purpose of discussion, let us consider new construction costing about $1 million for the portion designed by the engineer alone and for work not involving remodeling. With these factors fixed, the following are suggested as appropriate fee variations to reflect the differences in design costs.

¶ For ordinary plumbing design involving gas and water services and distribution piping, normal toilet room and service area fixtures, and normal sanitary and storm-drainage and sewers, let us assume a base of 100. A fee of 4 percent for this type of design is not too hard to live with.

¶ For more complex plumbing, such as is found in specially tailored custom suites for individuals or other special plumbing designs, the relative fee value should be increased to 125, depending on the complexity.

¶ Simple and routine electrical power distribution and lighting would be given a rating of 110.

¶ As the electrical design complexities increase, the design fee value should be increased to the range of 125.

¶ Simple heating, ventilating, and refrigeration design is somewhat more complicated than ordinary plumbing or electrical design, and

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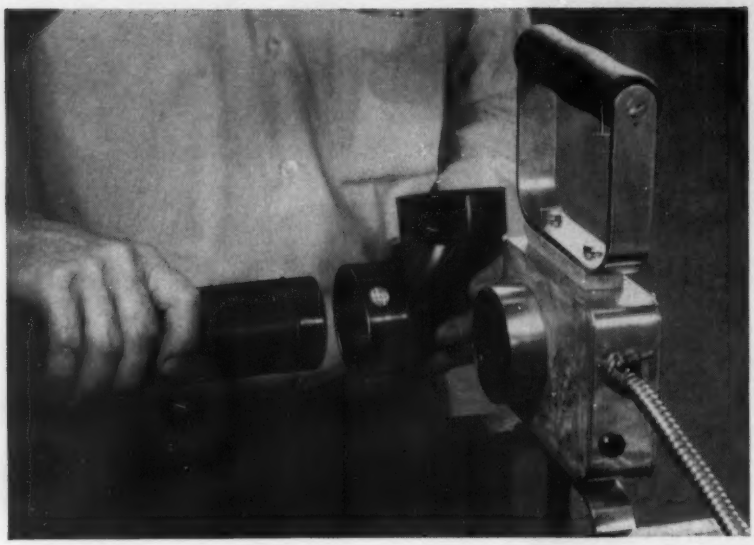

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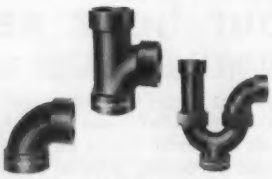

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I would set the relative merit at a figure of about 125.

¶ Next step up the complexity ladder is the design of air conditioning for year-round occupancy and comfort requirments. This I would rate at about 150.

¶ Last step in this general grouping would be highly specialized plumbing, heating, electrical, refrigerating, and air-conditioning for industrial and other special application. Relative value on the same scale would be 150 and up, depending on complexity.

Thus, we find quite a spread in the percentage fee which would be appropriate under different circumstances. It would be practical to use a cost times multiplier fee basis up to about $40,000 construction cost and a variable percentage fee for larger projects. The costs to provide engineering design services do vary with these factors and it seems reasonable that fees also should be varied.

Rather than a single hyperbolic fee curve showing percentage fee as a function of construction cost, we really need a family of such curves. In this case, the particular curve to apply to any project would be chosen after considering the various factors which have been discussed.

Summing Up

In my estimation, fee schedule manuals are multi-purpose documents. They point out — both to engineers and their prospective clients — suitable recognized methods for establishing fees. In addition, they provide an excellent method to set forth fundamental ethical practices, to describe services provided by consulting engineers, to discuss methods of payment of fees, and to indicate general contractual arrangements between engineers and their clients.

Fee schedule manuals are urgently needed by California's mechanical and electrical consulting engineers — now! ▲▲

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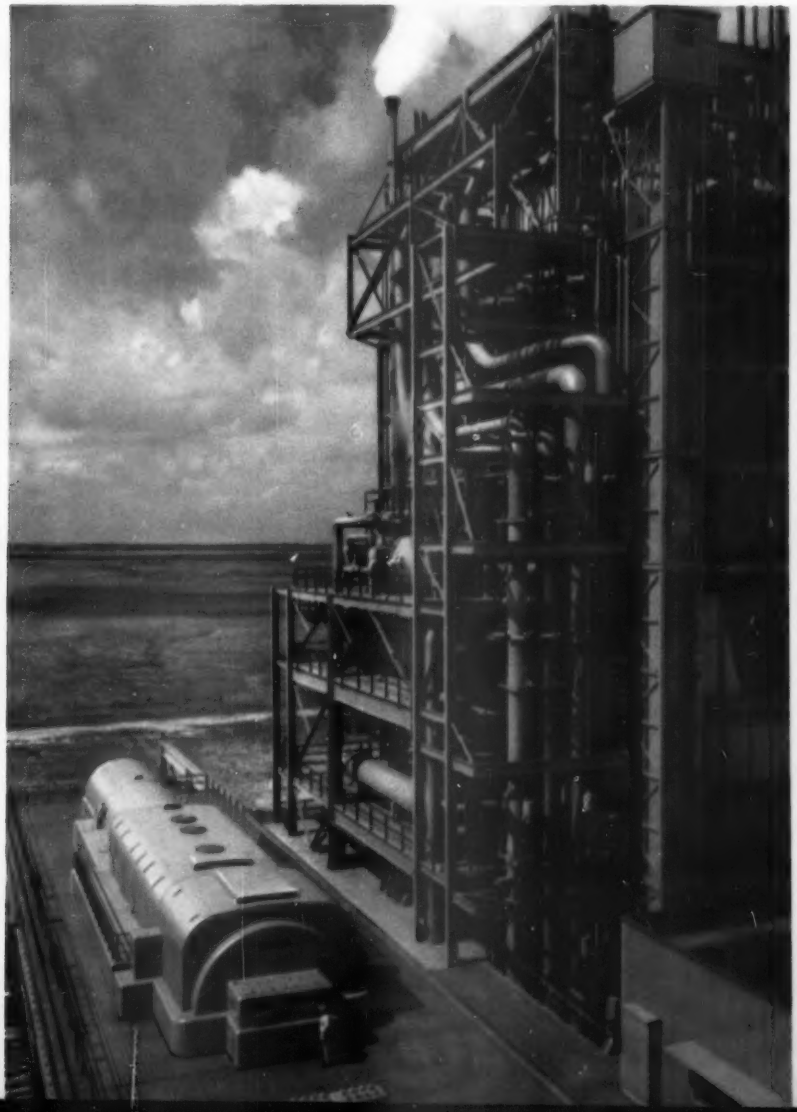

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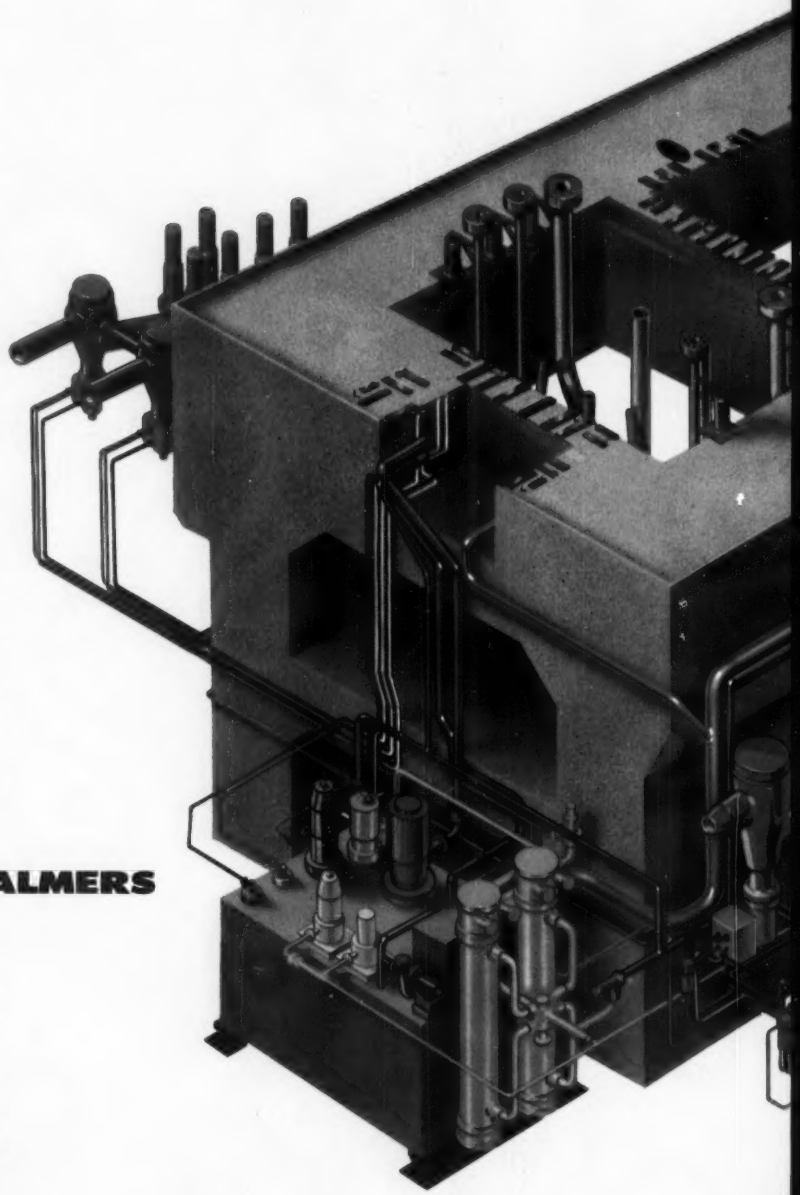
Advances such as these stem from Allis-Chalmers vast experience and forward-thinking engineering. They help electric utilities meet the economic and scientific challenges of tomorrow.



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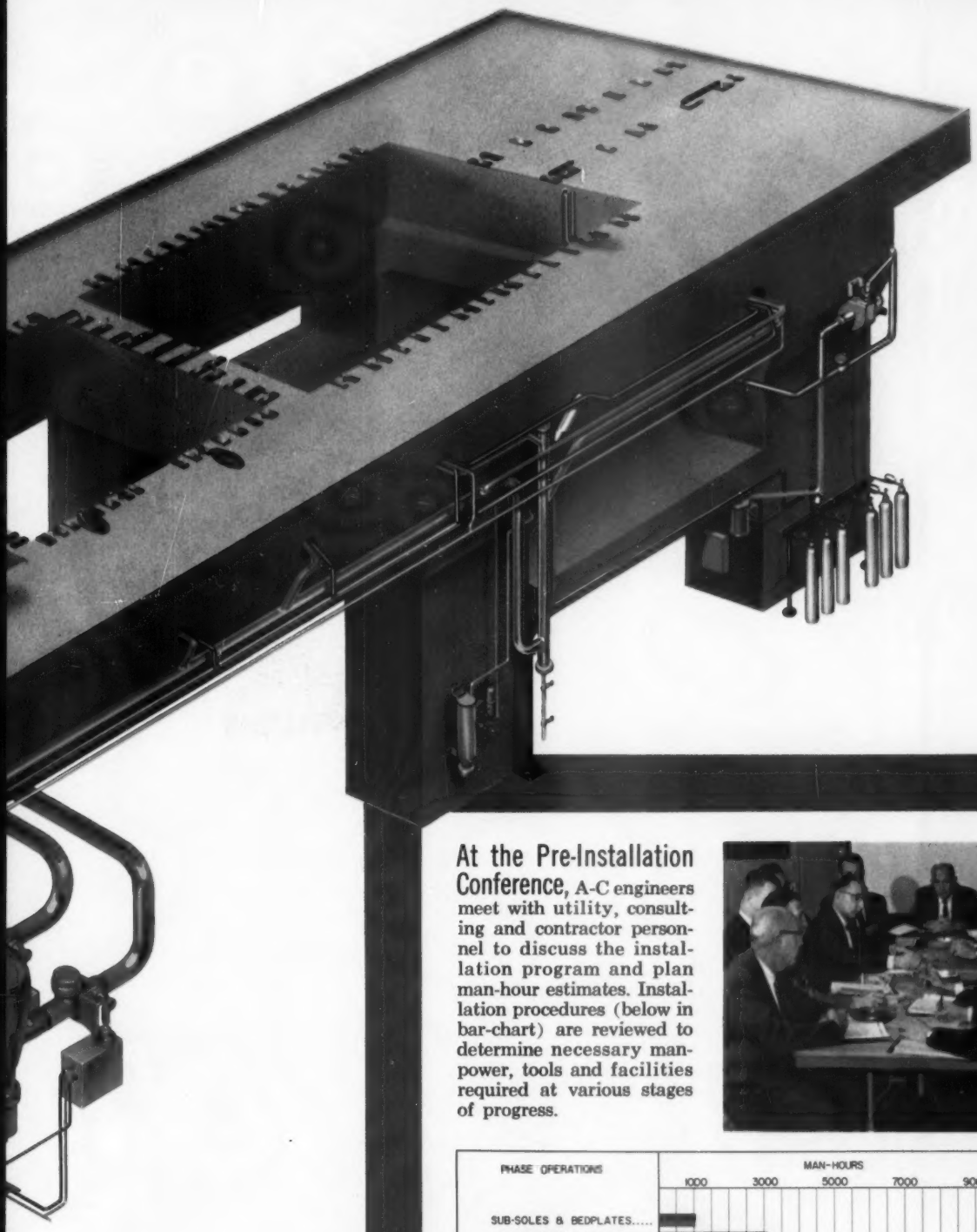
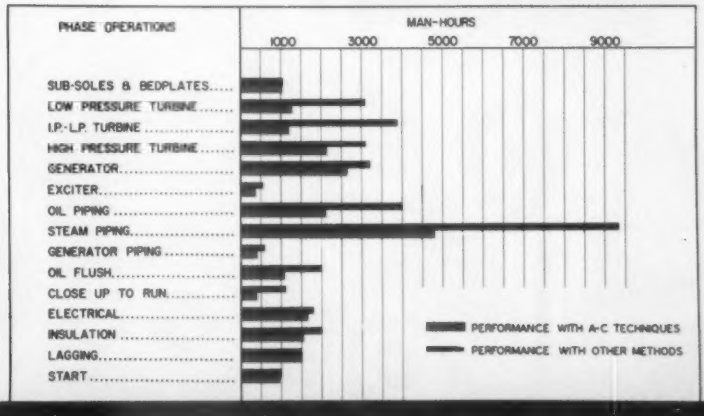
Pre-Installation of All Below-Floor Pipe and Equipment is completed prior to placing of main unit components on foundation plates. This technique saves thousands of man-hours — assures highest degree of cleanliness and quality for piping and closure welds. Complete oil tank assembly and piping, steam chest, reheat valves and piping, generator coolant and scavenging piping systems are installed with better control . . . also, less interference because fewer men are present; the work area more accessible.



At the Pre-Installation Conference, A-C engineers meet with utility, consulting and contractor personnel to discuss the installation program and plan man-hour estimates. Installation procedures (below in bar-chart) are reviewed to determine necessary manpower, tools and facilities required at various stages of progress.



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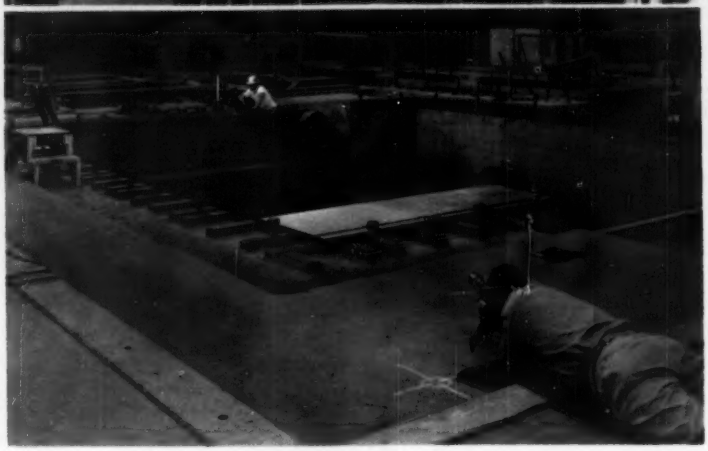

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University of Wisconsin's . . .

Institute for Consulting Engineers

STAFF REPORT

FOUR YEARS AGO, Bob Loetscher, of the University of Wisconsin Extension Division, began his first engineering institute for consulting engineers. He initiated an annual event which has become one of the finest shirt sleeve educational sessions for consultants anywhere in the country. This year's group, numbering just 32, was a little smaller than past groups, but just right to promote active discussion. The general theme was management problems, and there were management representatives from some of the largest firms in the country as well as some of the smallest. Both groups conceded that they had benefited materially from the two-day session.

The Wisconsin session was another indicator of the willingness of consulting engineers to contribute both time and money to the advancement of their profession. For example, Barney Dornblatt and George Heft journeyed to Madison from New Orleans; San Fosholt came from Muscatine; Bob Jaffer from Tampa; Bengt Friberg from St. Louis; and the State of Wisconsin was represented by Bob Rodwell, Earl Krueger, Harold Olsen, and Charles Yoder. It is a notable feature of the Wisconsin institutes that the mornings are devoted primarily to prepared speeches, with only a brief time allotted for discussion. However, the first afternoon is left open for general discussion by small groups and the second afternoon brings the whole group together for a general discussion of the entire program. With this approach there is little chance that the institute participants can leave Madison with the frustrating feeling that they did not get a fair chance to make comments.

A Good Idea

These Wisconsin engineering institutes for consulting engineers have had almost continuous representation on the part of sevaral individuals, and also several firms who send a different man each year. We can only wonder why other colleges of engineering or consulting engineer associations have not pirated the idea. Of course, some state associations are able to achieve the same goal with their regular chapter meetings, but only a few of them are well organized enough to do the job well. ▲▲

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Our Authors

John Girand studied civil engineering at the University of Virginia, then went on to Texas A&M, and later, research work at the University of Arizona. After work in the American Southwest and in South America, he formed the Arizona firm of Johannessen and Girand in 1942, continuing the work of the firm founded by his father in 1912. Girand is past president of the Arizona section of ASCE. His article on the money method of measuring engineering productivity begins on page 99.

William McGrath graduated from MIT as a mechanical engineer in 1946. Two years later he joined the firm of Hayden, Harding & Buchanan, Inc., as a junior engineer, and, with a two year break for service in the U. S. Navy, became chief mechanical engineer for the firm in 1957. Early this year he went into private practice as a mechanical consultant. McGrath is a member of NSPE and ASME. His article on the design of large incinerators for municipal disposal is on page 106.

Harold Woodward graduated from Cornell University, taking both Bachelor's and Master's degrees in civil engineering. He is now a partner in the New York firm of Seelye Stevenson Value & Knecht, in charge of the structural department. Woodward, who is registered in New York, New Jersey, Connecticut, and Texas, is a member of ASCE and the American Concrete Institute. His article, analyzing the trends and developments in the structural field, begins on page 102.

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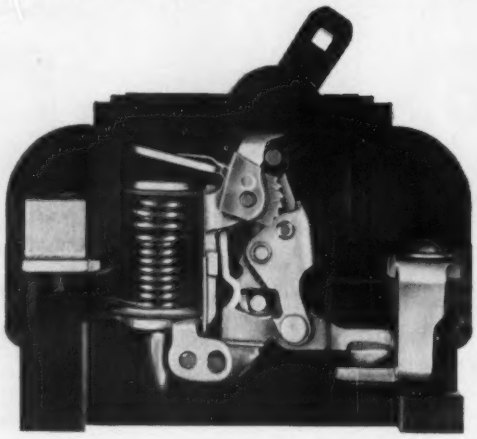

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Thomas J. Lazear received a Bachelor's degree in mechanical engineering from the University of California in 1957. He worked for the Southern California Gas Company for two years, then, in 1951, joined the Fluor Corporation in Los Angeles, where he is now a computer engineer. Lazear is an associate member of ASME, and is a registered mechanical engineer in California. **Eli Czerniak** received his Bachelor's and Master's degrees in civil engineering from Columbia University, and joined the Fluor Corporation in 1953 as a structural designer. At present he is a principal design engineer for Fluor. Czerniak is a member of ASCE and is a registered civil engineer in California. Lazear has been working on computers since he started work with Fluor, and Czerniak has worked on structural design, concentrating in recent years on the application of computer techniques. Their joint article showing the advantages of computer use in structural programming is on page 113. ▲▲

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The Readers' Guide

Engineers as Executives
page 84

"The engineer must realize that he is more object-minded, more rationally motivated, and less socially perceptive than the people around him." R. E. Moir points out the psychological differences between typical engineers and typical executives, and the difficulties an engineer must face when he becomes an executive.

The Digital Computer
page 113

"Generally speaking, computerization is best suited to problems that are repetitive both externally and internally; that is, they occur frequently, and each has a certain pattern of calculations that must be repeated several times to bring about a proper solution." Eli Czerniak and Thomas Lazear analyze the value of a digital computer in the structural design of complicated horizontal vessels.

Measuring Productivity
page 99

"One engineer working in crowded, noisy, substandard quarters on a productive job, is worth 10 doing busy work in a chrome-plated aircraft factory on cost-plus contracts." John Girand suggests that, as a measure of productivity, nothing is so indicative as money.

Designing Grain Elevators
page 92

"It might be simply stated that the price of grain storage is inversely proportional to the risk you wish to take. You could just pile it on the ground and hope for indefinite good weather. In this regard, it can be pointed out that the foundation of the structure is no place to attempt to cut costs." George Levin discusses the design of grain elevators – and the care and handling of speculators.

The Crystal Palace
page 88

". . . the greatest trash, the greatest fraud, and the greatest imposition ever attempted to be palmed off on the people of this country." CONSULTING ENGINEER London Correspondent F. C. Livingstone describes the construction of the famous Crystal Palace of 1851.

Municipal Incinerators
page 106

"The prospect of . . . destroying refuse through self-combustion has so appealed to community leaders that they have on many occasions accepted construction proposals which set profit above performance. They soon discover that they have taken title to a fuming monstrosity, belching dust and odor, and subsisting mainly on generous infusions of cash." William McGrath explains the design of municipal incinerators, and lists factors affecting their proper operation.

Trends in Construction
page 102

"Ideally, we should never have failures, at least not those attributable to deficiencies in the code. Codes are not infallible, even when based on research, since research itself is not infallible." Harold Woodward analyzes technical advances in structural design.

YARWAY news briefs

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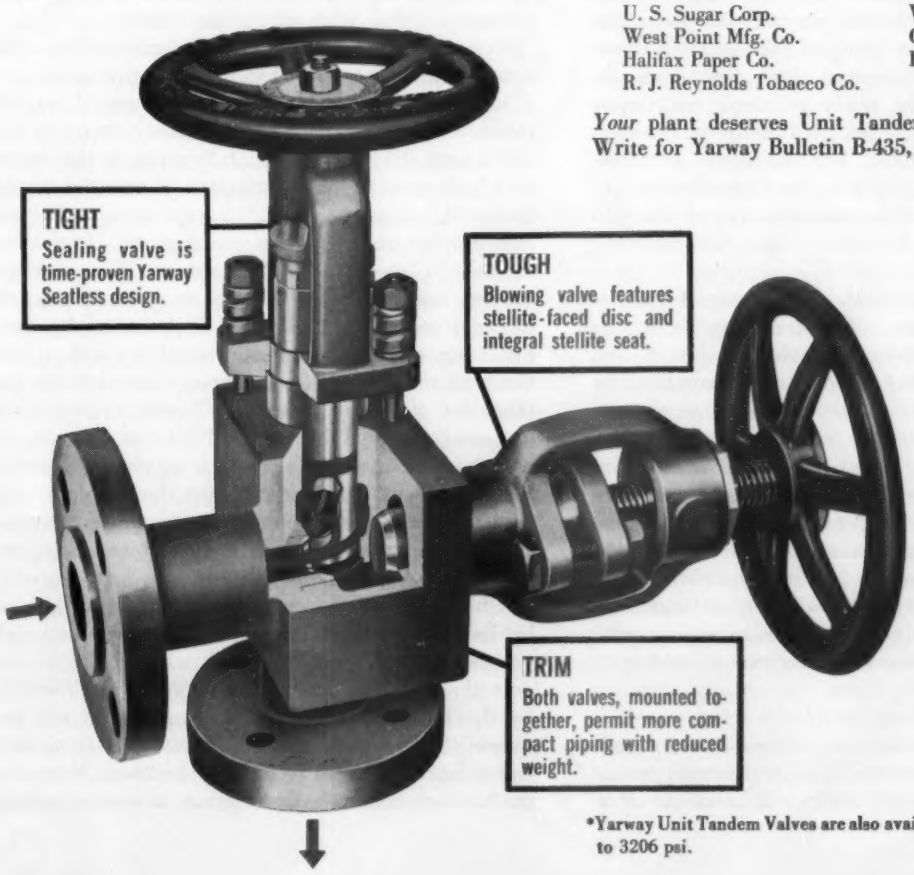
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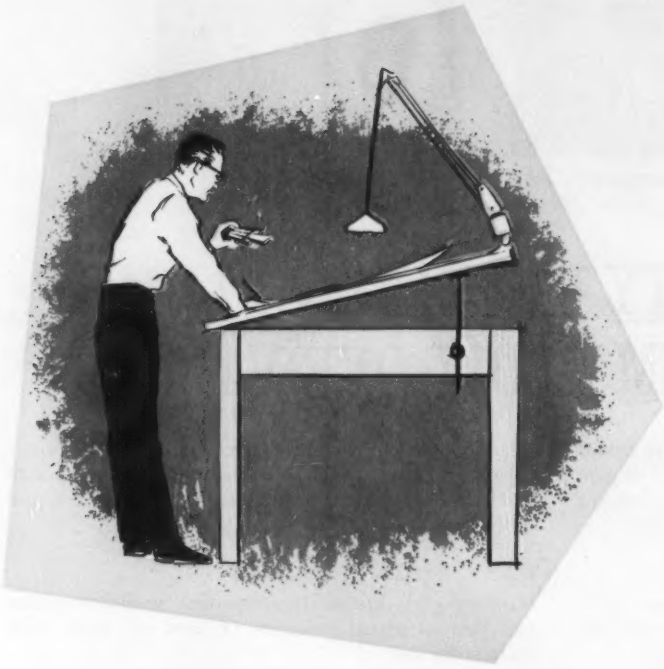


Engineers as

IN HIS *REPUBLIC*, written 23 centuries ago, Plato recognized the wide range of natural abilities in different men. But only in the past 50 years has there been any attempt to measure these differences objectively. Now, as the study of men's abilities — called psychometrics — becomes more accurate, it becomes more important. For maximum effectiveness and efficiency in a job, the characteristics of the worker must meet the requirements of the job. Psychometrics is an invaluable tool for matching men and jobs.

CE exclusive

Frequently, through choice or necessity, engineers develop into executives. The transition from one position to the other does not bother some men, and they become successful executives or combination engineer-executives. However, in many instances, a man is found incapable of transfer to an executive post, although he may have been a first-rate engineer.

Obviously, those qualities that go to make up a good engineer will not correspond exactly to the qualities found in a good executive. A study of the similarities and differences in the requirements for two jobs — as determined from tests of successful engineers and executives — may help explain who can make this transition and who cannot, and why.

Interest and Aptitude

For proper job selection, both interest and aptitude must be taken into account. High interest and mediocre ability, or exceptional ability with minimal interest, may be enough for moderate success in any field. But outstanding success is the result only of high interest coupled with exceptional ability.

One of the psychological characteristics indicating a technical interest — essential to engineering — is a high degree of masculinity, as measured on the masculinity-femininity scale commonly found in interest tests. The term masculinity refers to the extent to which an individual's attention is directed to the technical, depersonalized, manipulative, concrete activities or objects in his environment. As further defined in the Guilford-Zimmerman Temperament Survey, masculinity is, "Interest in masculine activities, not easily disgusted, hard boiled, inhibits emotional expression, little interest in clothes and styles." Contrast this trait with its opposite number on the other end of the continuum, femininity. Femininity is commonly typified by personal interest in cultural, esthetic, personalized, symbolic, appreciative activities, or objects. The trait is further described in Guilford-Zimmerman as "interest in feminine activities and vocations, easily disgusted, fearful, romantic, and emotionally expressive."

A high femininity score is characteristic of the verbal-linguistic interest group, represented by such professions as law and journalism. Psychologists expect the business detail interest group, represented by the bookkeeper and the accountant, to fall between the two extremes of masculinity-femininity scores but nearer the technically inclined. Normally, the business contact interest group, salesmen and ex-

Executives

R. E. MOIR

ecutives, falls between the two extremes but nearer those with verbal-linguistic inclinations.

The masculine-femininity (m-f) trait, measured with various objective psychological tests, is considered quite reliable as a tool in determining vocational suitability, and is measured on what is called an m-f scale. This scale has no quanitative limits in the sense that a yardstick has, but merely indicates the relative position in which different groups would be located along a commonly defined measurable trait.

Another trait that is commonly measured by written tests is the level of interest maturity. This is a phase of personality which characterizes the well organized, socially sensitive, generally mature, tolerant, insightful individual. This too is a continuum without absolute measure, but commonly the welfare or social uplift type of individual, such as a social worker or minister, possesses this trait to a high degree. The technical type of individual rates near the low end of the scale. All other identifiable groups fall between these two extremes.

In summarizing these objectively determined characteristics, we may say that, on the average, the less mature, less socially adept, more masculine individuals may be expected to show technical interests.

Analyzing Engineers

Many other characteristics of engineers are more difficult to pin-point and do not lend themselves to written tests. Fortunately, however, other interpretive methods have been found. The most important of these, for the purposes of this study, is the thematic apperception test. The thematic apperception technique consists of telling stories based on a standard set of pictures. The subject must read the meaning into the pictures, thereby revealing his thinking processes. The psychologist can analyze his reaction to these standardized pictures and interpret the subject's true inner feelings.

It is possible that personal bias could creep into the analysis, either consciously or unconsciously, if the observers were to make a study of one predefined group of individuals, trying to prove one thing or another. However, H. B. Moore and S. J. Levy avoided this danger by establishing criteria and then selecting individual studies that already had been made, without anticipation of their study. Thus, the analysis consisted of picking out the common threads in completed reports.

The criteria defined for this study of engineers included a definite statement of work satisfaction; a BS or higher degree in engineering; at least 4 years' experience after graduation; a minimum salary of $4200 (1951); and active engagement in engineering, not administration. The study generally bore out interest patterns as already explained, and provided several other correlating factors. The most important for consideration are verbal ability and orientation.

Moore and Levy found among engineers a wide range of verbal ability – from relatively awkward to notably fluent. Finding engineers on the lower end of the verbal ability scale is to be expected from the

previous explanation of masculinity-femininity — technicians are at the opposite end of the continuum from the verbal-linguistic group. The high correlation of intelligence with verbal ability* accounts for the high rating of some engineers on the verbal tests, since engineers as a group invariably rank high in intellectual ability. The wide range of verbal ability among engineers is not unusual — it follows the pattern to be found in almost any professional group. The incidence of high verbal ability in some engineers will become important in the actual comparison of engineers and executives.

Successful engineers, according to the Moore-Levy study, tend to prefer objects and processes to people and ideas. This is a predictable extension of the pronounced masculinity interest found in technical people, and certainly contributes to their efficiency as technicians. However, it would tend to hamper their efficiency whenever their responsibilities included work with or through other persons. In fact, the typical engineer is apt to find close personal relationships unnecessary. This, and the preoccupation with inanimate objects, would tend to make the engineer insensitive to or indifferent to the feelings and motives of people around him. The study concludes that "when problems arise that cannot be handled by impersonal regulations or procedures, the engineer is very likely to handle them that way anyhow."

Another characteristic for which engineers are noted is insistence on rigorous logical thinking and determination to find the factually correct answer. Since almost all problems profit from clear structuring, the capacity to define elements of a problem contributes to efficiency in handling everyday affairs. This faculty probably is heightened by mathematical disciplines to which engineers are subjected and by typical objective interests. This trait will help the engineer do executive work if he does not get frustrated by the inability to reduce business problems to a set of values and unknowns. Frequently the promotion of an engineer to a position where he must tackle vague and intangible problems, such as those that arise in the sphere of business administration and policy making, leads to a great personal unhappiness. In these cases, the promotion transforms a good technician into a fumbling executive.

Analyzing Executives

Just as engineers as a group are found to be heterogeneous and broadly defined, so also were executives. Uniform terminology is one of the basic problems of scientific study, and even the men commonly referred to as executives seldom define the word in the same manner. Perhaps as good a definition as is to be found is the one that appeared in a 1956 issue of *Fortune*. This definition was the composite answer to a survey of a large number of executives:

> "An American executive is a person paid for a full time job in which he: (1) directly helps to set his company's objectives and overall policies; (2) is required to make and approve decisions that significantly affect profits and future plans; (3) coordinates several major corporate functions, or those of a major division or department; (4) maintains and develops an organization of trained subordinates to achieve the company's objectives; and (5) delegates responsibility and authority to the organization, and controls performance and results through at least one level of supervision."

Unlike technicians, executives do not exhibit clear-cut traits on the masculinity-femininity and interest maturity scales. This fact has retarded selection on a positive basis. People exhibiting m-f traits to either extreme will indicate a disinclination to executive duties, but the broad middle range of executive interest is not highly selective in itself. Social intelligence tests may give more accurate indications of executive ability in the future, but presently they can serve only to eliminate those subjects of low aptitude. As paper-and-pencil tests of more objective measure do not discriminate effectively, other techniques must be used. Dr. Anastasi writes:

> "The evaluation of sales and executive personnel is based largely upon personality characteristics such as motivational, interest, and emotional factors . . . biographical data and interviewing techniques have proved to be the most effective source of information in these fields. In varying degrees, these techniques are required in evaluating all high level personnel, while standardized tests are more serviceable at lower levels."

As this authority contends that the biographical data sheet sheds some light on the executive profile, it will be well to look closely at a composite case history of 33 top executives as published in the July, 1953 *Harvard Business Review*.

This study indicated that the executives' highest registered interest was in dealing with people to enlist their cooperation in the implementation of new projects, and in the written and spoken word as a means of communicating their ideas. The participants demonstrated the next highest interest in work involving the use of numbers, and an average interest in artistic and creative work, musical activities, routine office work, and scientific pursuits. Their interest in mechanical tasks was below average.

These indicated interests substantiate the executives' position in the masculine-femininity and interest maturity scales, this position being notably different from the engineers' interest. The executives' high interest in verbal communication does not cor-

*Many of the most reliable intelligence tests rely heavily on the determination of word-power as a measure of intelligence.

relate with the engineers' interests, which ranged from handicapped to fluent. However, the engineers' mathematical aptitude and interest in numbers more nearly parallelled that of the executives'. The significant point to recall in these comparisons is that while the engineer is highly interested in machines and hardware, he shows little interest in the people around him. On the other hand, the executive is highly interested in people and shows a below average interest in machines and hardware.

In the search through many books and articles, it has been observed that six traits are frequently mentioned as desirable in executives: (1) maturity, (2) drive, (3) social perceptiveness, (4) enthusiasm, (5) sympathy, and (6) empathy. The preceding enumeration of these desirable traits was followed in one article by the statement: "All of us can increase our amounts of them (the six traits) by being people-centered, not job-centered, in our thinking".

Engineers In Management

Numerous surveys indicate that there is a large proportion of engineers at most levels of industrial management. Most engineer-writers would have one believe that these statistics prove engineering training constitutes a good background for administration. This does not necessarily follow. Who are the executives of today? By and large, they are the men who started at the bottom of the managerial ladder 20 or 30 years ago. To arrive at any plausible evaluation, we would have to know how many employees of each type of background were hired in some base period and then compare these statistics with the number of each type of background who comprise today's management group. This would give a "relative effectiveness ratio". Even this ratio would be only a tentative answer, as it would not reflect the bias of previous management in the promotion of junior executives. (Certainly, most men will look more favorably on someone with a background similar to their own.) Nor would this ratio allow for past economic and sociological conditions that may or may not exist in the future. So it can be demonstrated that the number of engineers in executive positions proves very little about their inherent qualifications for managerial duties.

One factor in the problem not usually considered is that, when the older top executives were starting their careers, they had little competition (in numbers) from graduates of schools of business administration. Things are different today. This seems to indicate that even a 50/50 split between engineers and the other professions in top management today would demonstrate a relative loss for engineers.

However, the need for technological knowledge on the part of management will not be lessened in the future. Engineers will still be in demand as executives, and the problem faced by personnel management is to evaluate the positions to be filled and determine what mixture of technical and managerial talents are needed. Likewise, the supply side of the equation must be related to the number and type of people available.

A practice, common in the past and still prevalent today, is that of maintaining only one path of advancement, the managerial path. This practice has promoted technical men out of the technical field, for which they were suited and naturally endowed, into the managerial field, for which they are not equipped, either by training or inclination. However, progressive managements have provided a nearly parallel, technical path, leading to success in his own field for the technical man.

The Engineer's Choice

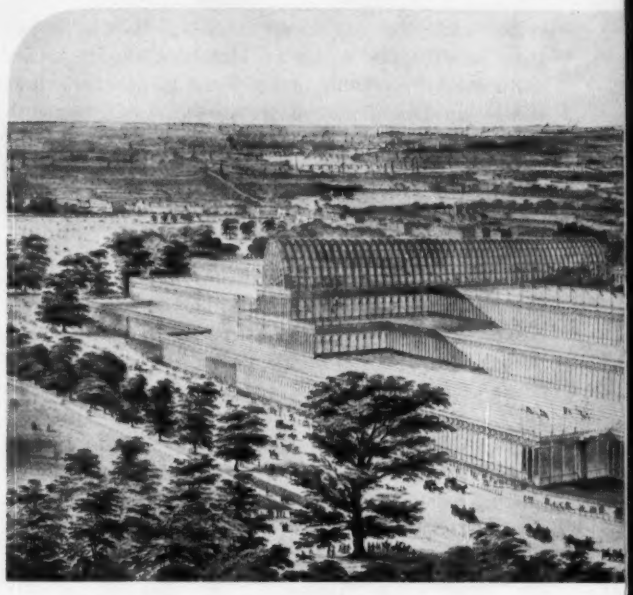
Some of the more important characteristics of engineers and executives have been enumerated, and it is in the individual engineers' interest to attempt to determine how his interests and aptitudes correlate with those of successful men in his field. If the engineer finds that technical work brings personal satisfaction and an increasing amount of success, he probably should try to steer his development in the technical direction. If, on the other hand, he feels his interests lie in the field of management, he should try to broaden his scope to prepare himself for managerial responsibilities. Yet he also should recognize that self-development is a hollow effort if management does not intend to make full use of his talents.

Engineers and personnel managers are beginning to realize that the engineer who chooses the latter path faces a tremendous task of re-orientation. The engineer must realize that he is more object-minded, more rationally motivated, and less socially perceptive than the people around him. He must realize there is more involved in getting other engineers to work effectively than knowing how to work effectively himself. He must realize that the very nature of his training has made him atypical in a social situation, and that his command of inanimate forces has not prepared him for leadership. He must develop the ability to delegate authority, communicate effectively, plan, coordinate, control, and exercise many more techniques of management that he has not had to implement as an engineer.

The objectives of the engineering profession can best be served by an enlightened approach to the problem of transforming some engineers into executives. The solution lies in recognizing the psychological elements that differentiate engineers and managers, and then applying the personal characteristics of the individual involved to the particular situation. As a starter, we could all do well by following the admonishment of Socrates: "Know thyself." ▲▲

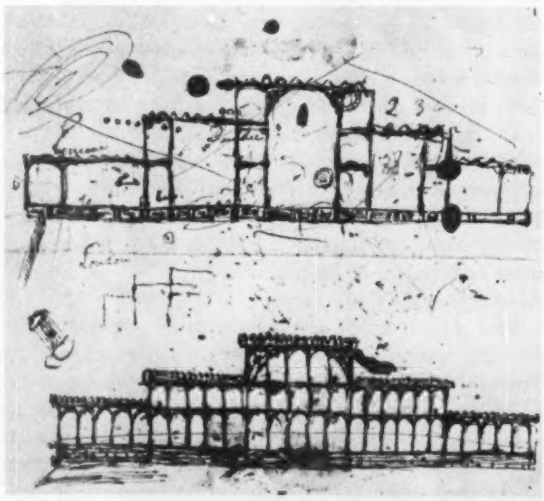
London's Original Crystal Palace

F. C. LIVINGSTONE
CE London Correspondent



This bird's-eye view of the Crystal Palace, from the northwest,

A new glass and concrete exhibition center, to be built in London, will be called Crystal 61, commemorating the original Crystal Palace. The great Exhibition of 1851 — the reason for the building of the Crystal Palace — was described in the September 1958 issue of CE.



Paxton made the original rough sketches for the design of the building while doodling at a director's board meeting.

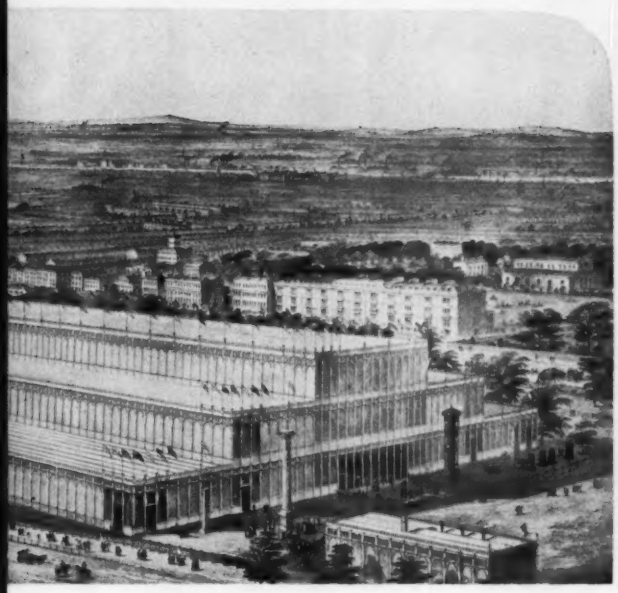
UNTIL THE LAST DAY of November, 1936, the Crystal Palace, on Sydenham Hill, was one of the most prominent and best known landmarks in the city of London. That night, a fire broke out in one of the lower offices, and by morning, all that remained was a shapeless tangle of melted glass and twisted iron. For 25 years the site has stood empty, only slightly disturbed in 1941 when several tons of German high explosives fell on it. But this summer, a new Construction Equipment Exhibition is planned on Sydenham Hill, and nostalgic Englishmen wonder if this may herald the rebirth of the Crystal Palace.

CE exclusive

The palace was built in 1850-51 to house the Great Exhibition of the Works of Industry of All Nations of 1851 — the first real World's Fair. It was originally erected in Hyde Park, one of the Royal Parks in central London. After the Exhibition, it was dismantled, and re-erected on the city's outskirts.

The Great Exhibition was the pet project of Prince Albert, husband of Queen Victoria. He organized a commission of prominent men to plan the exhibition, and conducted an international competition for the design of the building to house it. According to the plans the Commission released in 1850, the structure was to cover about 16 acres.

Nearly 250 designs were submitted from all over Europe, and the Commissioners were singularly unhappy with all of them. So, led by Prince Albert, they concocted a grotesque hodge-podge of brick, concrete, stone, wood, and glass. Fortunately for the Exhibition,



finest rendering ever made of the Great Exhibition building.

the Commissioners' design was never followed. Joseph Paxton, a Midland Railway director who started his professional life as a gardener, saved the day.

The Final Design

Paxton visited the newly-rebuilt House of Commons in June of 1850, and found it "deplorable." He commented to a friend that "they will probably also commit a blunder in the building of the Exhibition. I have an idea of what should be done." At a meeting of his railroad's board of directors, he sketched a basic design on a blotter. Within two weeks, he and a small staff completed the entire plans for the building. He raced to London with them, and presented them to the Royal Commission.

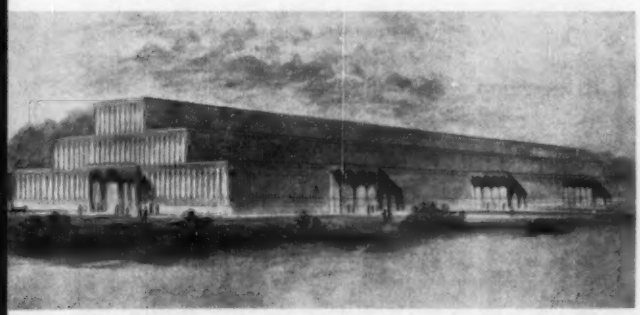
The Commissioners agreed that Paxton's plan was unlike anything else that had been suggested, but were unsure whether this would be a triumphant victory or an abysmal defeat. The plan for the Exhibition was already under heavy attack from the press, and from certain members of Parliament. As the staid *Times* put it, "By the stroke of a pen our pleasant park — nearly the only spot where Londoners can get a breath of fresh air — is to be turned into something between Wolverhampton and Greenwich Fair. The project looks so like insanity that, even with the evidence before us, we can scarcely bring ourselves to believe that the advisers of the Prince have dared to connect his name with such an outrage to the feelings and wishes of the inhabitants of the metropolis."

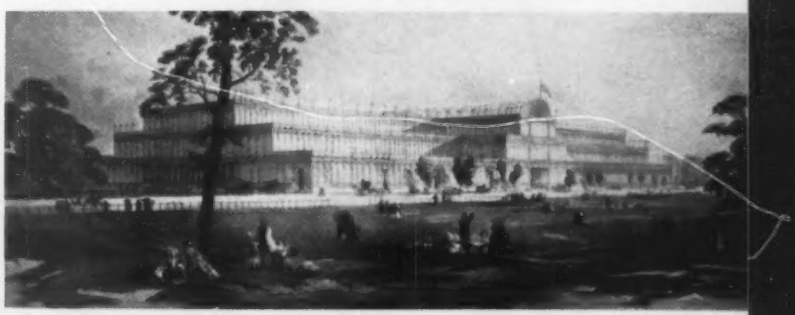
Faced with delays and opposition that might easily destroy his idea, Paxton forced the issue. He had his plans published in *The Illustrated London News*. His great glass building immediately won immense public support, and Parliament and the press gave in. In November, the weekly magazine *Punch* referred to the building as the Crystal Palace. The name stuck.

Construction Begins

When the Royal Commission was formed in January of 1850, Prince Albert optimistically announced that the Exhibition would open on the First of May, 1851. However, with the delays in planning, the contractor did not start work on the site until July, 1850. That left exactly nine months for the construction of a building that would probably take that long even with modern tools and methods. In September, only 39 men were on the job; in October there were 419; in November, 1476; and in December, 2260. From December through May, an average of more than two thousand men was on the job every day.

In July, stakes were set to mark the columns, and a board fence was put up around the site. (The fence was to be torn down later, and the lumber used for flooring and interior framing.) In August, the concrete was laid for the foundations, and more opposition started. Paxton, who was not formally qualified as either an engineer or an architect, was attacked by members of the professions, who claimed that the foundations would give way; that it would collapse of



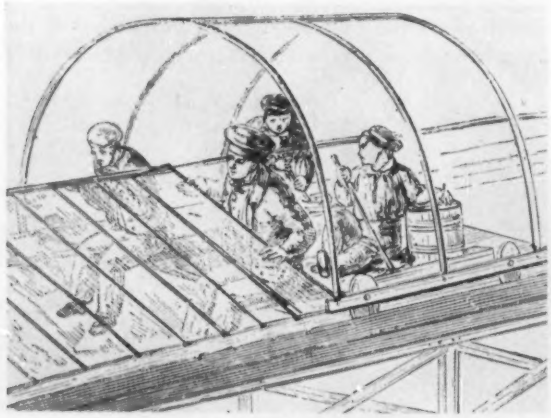


The original plan for the building as published in the "Illustrated News" (left), and the same view of the actual building.

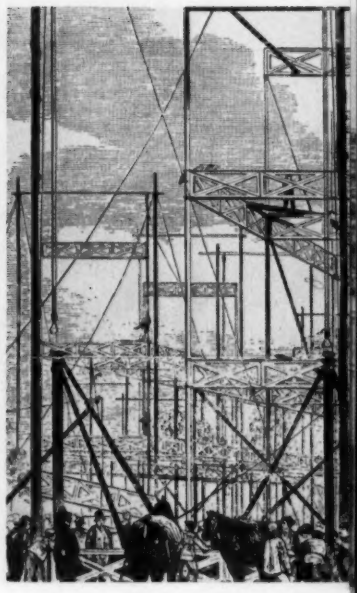
its own weight; that the wind would blow it over; that the movements of crowds within it would shake it down; that hail storms would destroy it; and so forth. But none of these skeptics was taken very seriously, and work progressed without a hitch — until Col. Charles de L. Waldo Sibthorp entered the picture.

Sibthorp was a 67-year old Member of Parliament, something of a cross between Senators McCarthy and Claghorn. He had distinguished himself the year before by opposing a Public Libraries Act, on the grounds that he himself did not enjoy reading, and could see no reason why others should. The colonel centered his attack on the Exhibition around the fate of some elm trees, which were to be cut down to make way for the building. The true nature of his opposition may be indicated by a speech in the House of Commons, when he decried " . . . the greatest trash, the greatest fraud, and the greatest imposition ever attempted to be palmed off on the people of this country. The object of its promoters is to introduce amongst us foreign stuff of every description — live and dead stock — without regard to quantity or quality. It is meant to bring down prices in this country, and to pave the way for the establishment of the cheap and nasty trash and trumpery system . . . All the bad characters presently scattered over the country will be attracted to Hyde Park . . . that being the case, I would advise persons residing near the Park to keep a sharp lookout after their silver forks and spoons and servant maids."

Rather than risk another time-consuming debate, the original straight, flat design of the building was altered, and the barrel-vault transept added to cover the three largest trees. The smaller trees were left standing inside the building until construction was nearly complete and they could be cut down privately and quietly. Colonel Sibthorp was sent off to tilt at other windmills, and the building was finished on schedule. The vaulted transept over the three large elms was left in, and eventually came to be regarded as one of the truly distinguished items of the design.



Over a quarter-million panes of glass went into the Palace.



Final stages in erection of the structural framework. This view from the south shows the shear-leg cranes that were used to hoist all materials in the building.

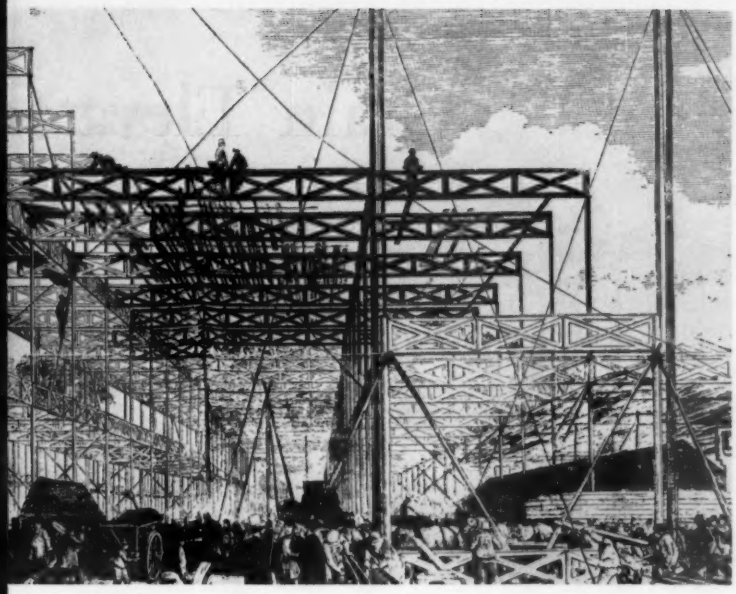
Construction Details

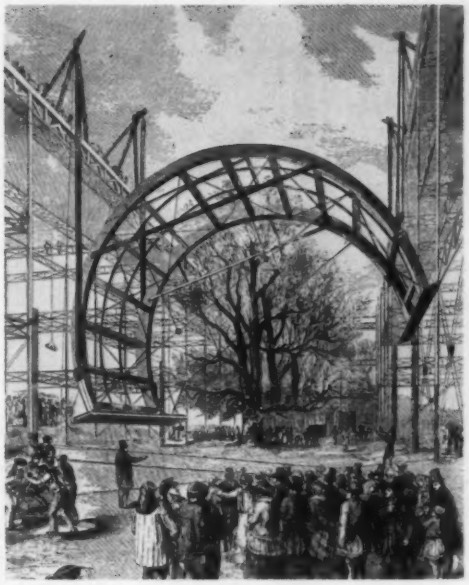
About 4500 tons of iron were used in the building — 3800 tons cast and the remainder wrought. As each casting was delivered to the job site, it was inspected, tested, and painted. The test consisted of subjecting each piece to a strain of 9, 15, or 22 tons, depending upon whether it was to be used in the walls, the galleries, or the roof. The timing of delivery and the setup for tests was so efficient that it was possible for a girder to be lifted out of the delivery wagon, weighed, examined, tested, and dropped in a storage stack in less than four minutes.

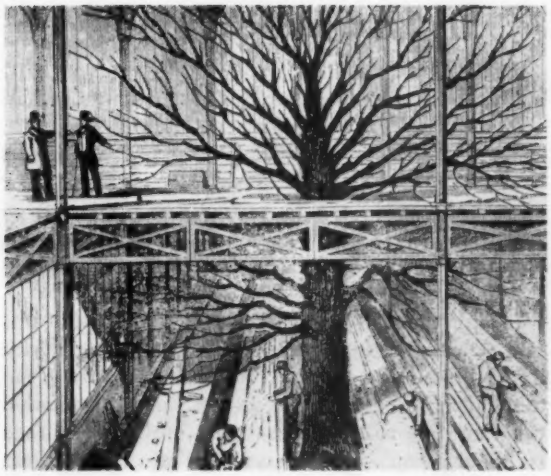
Simple cranes — shear legs with multiple pulleys at their apex — were used to hoist practically every piece of the iron framework. The columns were raised in pairs, and a girder attached between after they were up. When a second pair was erected, cross girders were hoisted and set, and a 24-ft bay was complete. As soon as enough of these bays were connected to give a substantial base, work was begun on the second and third tiers. Using existing construction as a platform, the workers put up the entire building without the use of scaffolding.

The hardest part of the construction was the placing of the main ribs for the transept roof. Hoisting and setting the 16 wooden ribs took a full week.

There were over 293 thousand panes of glass in the original Crystal Palace, almost all of them 49-in. by 10-in. sections used for the roof. The plans and preparations for glazing the roof were Paxton's. He had designed the framework with allowances for special gut-







"Sibthorp's elms," which forced changes in original plans.

ters just below the level of the roof. When the framework was completed, small carts were lifted to the gutters to carry the men along as they placed the glass. Two glaziers and an assistant rode each cart, protected from the elements by a special shield (this stage of the construction did not start until the middle of December). One crew of 80 men put in over 18 thousand panes in one week; the individual record went to a man who put in 108 panes in one day.

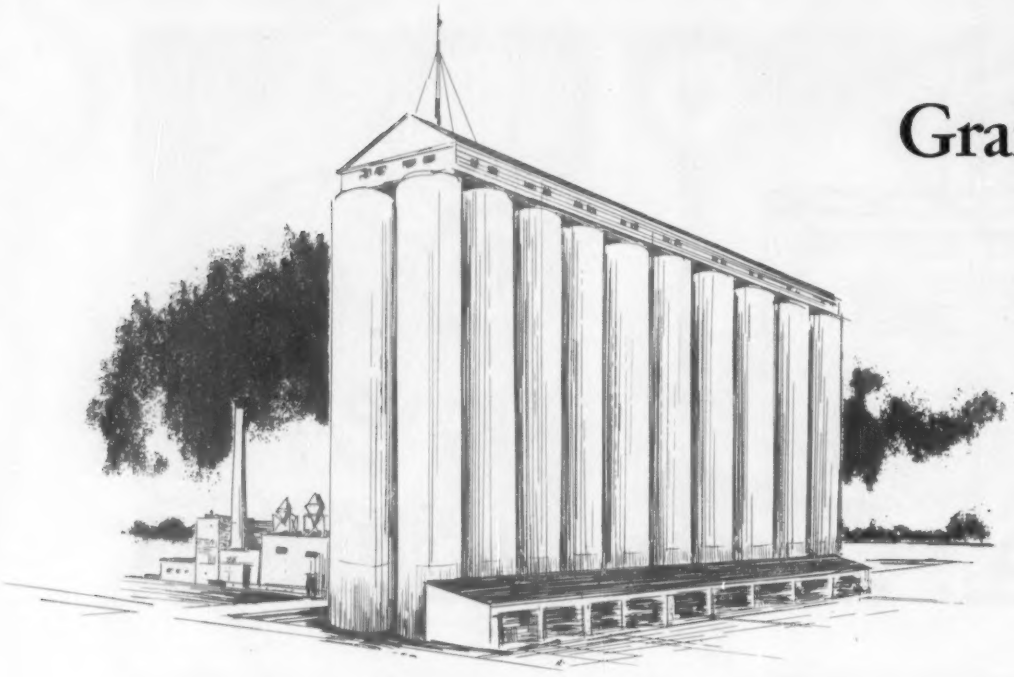
As the May 1 deadline approached, it was obvious there would not be enough glass in the country to complete the job, so workers had to be imported from the Continent. This was at a time when each piece of glass was made separately. The process was described in the *Official Popular Guide* to the Exhibition: "The workman, having taken up a lump of glass on the end of his pipe, alternately blows, swings his ball of glass to and fro, and rolls it upon a metal table until it assumed the form of a long cylinder; the ends being then taken off, and the cylinder cut in the direction of its length, the sheet of glass falls down, is flattened to a true face, and is then trimmed off and finished."

The Exhibition

The Great Exhibition of the Works of Industry of All Nations of 1851 was, at least partly because of Paxton's Crystal Palace, a huge success. It was opened May 1 by Queen Victoria and Prince Albert, and closed October 11, 1851. The Palace, 1848-ft by 408-ft in the main section, covered nearly 19 acres. Nearly 14 thousand exhibitors displayed more than 100 thousand items, including the Koh-i-noor diamond, the McCormick Reaper, a preserved pig, much furniture, and dozens of statues of semi- or undraped females.

The crotchety Col. Sibthorp admitted the building was impressive from the outside, but refused, on principle, to enter it. Paxton, for his design and supervision of the work, was knighted and given $25 thousand of the profits. Seven others, most of them members of the Royal Commission, were elevated for their work on the project. The profit realized from the Exhibition and from the subsequent sale of the Crystal Palace has financed the activities of the Royal Commission, and provided hundreds of scholarships in the Arts and Sciences. These "1851 Scholars," as they are known, have produced 46 members of the Royal Society, and seven Nobel prize winners. ▲▲

Grain Elevator



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GRAIN ELEVATOR design is a compromise between the economics of the market place and the practical application of engineering. It is difficult to decide which comes first, but it can be assumed that the design of the foundation depends upon the dimensions of the storage bin. These depend upon the volume and shape of the bin, which are in turn related to the use to which the storage is to be put. Elevator operations are, obviously, related to the economics of grain storage in general and to the capital costs and operating expenses of the planned facility in particular.

The two basic parts of a grain elevator are the bin space – normally called the storage – and the elevating, weighing, cleaning, and distributing space – normally called the working house. Considerations affecting the cost of grain elevators are governed by the type of use to which the facility is to be put. If it is simply a storage facility rented by the government, it is quite different from the merchandising facility where grain is almost constantly moving in and out. However, once all the layout factors have been determined, the cost is fixed – with the exception of the foundation, which will vary with the type of bearing soil on the site.

This can be illustrated by assuming two identical elevators, one supported on good bearing soil and the other supported on piling. Assuming 1000 bushels of wheat, at 60 pounds per bushel as a unit, the grain load would be 60,000 pounds, or 30 tons. Normally, the dead load is assumed to be about one-half of the grain load, making a total load of 45 tons. Assuming a 30-ton permissible load per wood pile, each unit of 1000 bushels would require 1½ piles. At an average cost of $2.15 per foot, the placing of 1½ piles, 50-ft long, would total approximately $160. This would result in a unit cost of 16 cents per bushel for the piling alone.

It is probable that the cost of additional pile caps will not be much greater than the cost of a thick mat required for any other foundation on soil. But the additional cost of 16 cents per bushel in relation to an average cost of 55 cents per bushel for storage (without piling), has a tremendous effect. Sometimes the piling cost alone is the factor that determines whether the venture is economically sound or not.

Today, a million bushel inland elevator, without any special foundation problems, costs about 55 cents per bushel. For waterfront storage the cost might be 75 cents a bushel. The 20 cent differential between these two figures lies primarily in the foundation system. On a waterfront, it is generally necessary to use piling driven to a considerable depth.

At inland locations, where foundation problems exist, the engineer must decide whether the additional cost of piling will make the venture unprofitable. He must explore methods of designing the foundation so it can be supported directly on the earth or find a different site in the same general area. After the engineer considers these possibilities, he may find that the project is not economically feasible.

Design

GEORGE LEVIN
Consulting Engineer

The dead loads that are imposed on a conventional storage structure are easily calculated. Typical storage consists of adjacent cylindrical concrete tanks, with resulting interspaces. Given the dimensions and the weight of the concrete, the dead loads can be determined easily. To this is added the weight of machinery and other fixed loads in the building.

The live load, naturally, depends upon the weight of material stored within the bin — and the unit weight of grains varies considerably. The standard test weights for Nunber One Grade of the common varieties are as follows:

Wheat	60 pounds per bushel
Soybeans	56 pounds per bushel
Rye	56 pounds per bushel
Corn	54 pounds per bushel
Flax	49 pounds per bushel
Barley	47 pounds per bushel
Oats	32 pounds per bushel

Unfortunately, what the layman calls a bushel and what a grain merchant calls a bushel are two different things. Grain merchants ask whether a bin has a certain volume in "oat bushels" or "wheat bushels." Their insistence that there is a difference is aggravating, particularly when it follows a careful explanation that a bushel is a volume of measure equal to 2150.42 cubic inches, or 1.2445 cubic feet. Most engineers finally learn to simplify the conversation by talking only about "wheat bushels." A U. S. Standard or Winchester bushel, as engineers use the term, represents a volume of approximately 1¼ cubic feet. When a grain merchant uses the term, he is speaking of a trading unit, or a standard bushel — 32 pounds of oats, or 60 pounds of wheat.

For example, he may buy heavy oats which actually show a test weight of 38 pounds per bushel. He then can store more weight in a given volume than he could with standard oats. He takes his total weight and divides it by 32 to obtain a given number of standard bushels. Thus, he is able to store, say 19,000 bushels of oats in 16,000 bushels of volume. It would be better if all reference were to weight, but since the trade talks bushels, the engineer must follow suit.

Engineering Characteristics of Grain

What is known as the "packing effect" apparently occurs in bins, but it has neither been proven nor disproven. Supposedly, the large volume in a bin causes the material to compress, so that approximately 4 to 5 percent more material can be put in than the loose grain volume indicates. There is good reason to believe that this involves the various grades and types of grain going into the bin as well as an actual "packing effect." However, this is not taken into account in the calculations. As a general practice, engineers associated with grain elevator design use 60 pounds per bushel (48 pounds per cubic foot). This is rounded off as 50 pounds per cubic foot material.

The engineer should be wary of the client who insists on a design for oats storage only. Under changing market conditions he may suddenly decide to switch to wheat. If the lighter commodity is used as the basis for the elevator design, the use of the storage is forever limited. The structure cannot readily be strengthened to accommodate heavier commodities which the owner later may want to store.

The pressure exerted by a granular, noncohesive material is not distributed equally in all directions as it is by liquids. Actually, the pressure in a grain bin is related more directly to its diameter than to its height. Knowledge of how these pressures are distributed within the bin is very important.

Almost all modern grain elevators are designed by what is known as "Janssen's Formula." Janssen did his original work in 1895. His first tests were made on wheat and corn in wooden bins that were 12, 16, and 24 inches square, and 5.95 feet high. Subsequently, tests have been made by various interested persons, one important one having been made at Iowa State College in 1951. These tests have always shown that Janssen's Formula is on the safe side.

The above experiments were made in a small reinforced concrete cylinder which was only 5-ft high, with an 18-in. inside diameter. This small scale test structure was similar but not exactly proportional to those actually being built. There is room for argument that consideration of the relationship of the bin diameter to the actual particle size might have

great significance. This would produce something similar to the Reynolds Number for fluids.

It is, however, safe to assume that Janssen's Formula is a good basis for a grain bin design – for bins whose discharge opening is in the center – and that it mathematically indicates the magnitude and location of the loads approximately (although not exactly) the way they appear to occur in tests. By experiment, it was determined that an "average" value for the coefficient of friction of wheat on concrete was 0.4167, and further, that a k value of 0.6 was "accepted" for wheat in concrete bins. Using these values, we find that the expression $4k\mu = 1$. This is not science – it is convenience. It takes a great stretch of the imagination to presume that experimental results come out this neatly, but it makes for convenience of computation. By adding some convenience of our own, we can say $V \div D = 50$, and $L \div D = 30$. Unless the storage structure is low, with a height less than 3 diameters, these are the values used.

It is now possible to develop a reasonable design for grain storage using the information so far presented, together with common structural engineering formulas. It must be remembered that while the ACI Standard Building Code serves as a guide for all concrete design, the code is not based upon, nor is it written for, the type of construction usually used for grain elevators. In particular, the code does not apply to mat foundations, and it is not applicable to slip form construction. Grain elevator designers are cast adrift and must deduce their formulas from fundamental theories of structures, or they must proceed most cautiously if they choose to follow methods based on empirical formulas.

JANSSEN'S FORMULA

For round, square, or other bins in the form of regular polygons where the hydraulic radius $\frac{A}{P} = \frac{D}{4}$

Lateral loading $L = KV$

Vertical loading $\frac{V}{D} = \frac{W}{4K\mu}\left(1 - \frac{1}{e^{4K\mu H/D}}\right)$

Where, for wheat in a round concrete bin:

H = height of bin

V = vertical pressure of grain, lb per sq ft

D = diameter of storage bin

W = weight of grain, lb per cu ft = 50

L = lateral pressure of grain, lb per sq ft

K = a constant, the ratio $\frac{L}{V} = 0.6$

μ = coefficient of friction, grain on wall = 0.4167

A = area of cross section of bin

P = circumference of bin

Thus, for wheat:

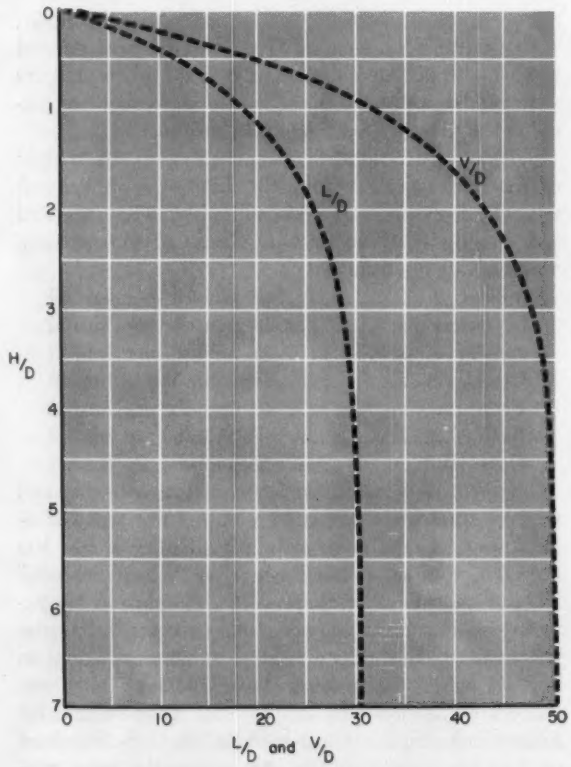
$4K\mu = 4 \times 0.6 \times 0.4167 = 1$, and $\frac{V}{D} = 50\left(1 - \frac{1}{e^{H/D}}\right)$

TABLE I

$\frac{H}{D}$	$\frac{V}{D}$	$\frac{L}{D}$	
1	31.61	18.96	
2	43.23	25.94	
3	47.51	28.50	
4	49.08	29.79	Most conventional grain tanks fall in this range. For convenience, the numbers are rounded off: $\frac{V}{D} = 50$, and $\frac{L}{D} = 30$.
5	49.66	29.79	
6	49.88	29.92	
7	49.95	29.97	
10	49.99	29.99	

Cost Aspects of Design

A grain storage facility is not a simple storage bin – it is a factory, an economic venture. If this factory, like any other plant, cannot be built or operated economically, it will not be built. While this is one solution to the problem, it is not a very good



Janssen's formula for determining pressure in tanks. Graph at right is a plot of ratios which are listed in Table I.

one. The feasibility of any proposed economic venture is always investigated. However in the grain trade, it is scrutinized even more closely.

Grain is traded in eights of a cent per bushel. This is a minute amount in terms of a $2 per bushel commodity. Because the grain traders buy and sell in cents per bushel, they figure their profit and their expense in cents per bushel, and they purchase storage capacity in cents per bushel. Once the general size and operational requirements of a facility have been determined, the total over-all cost of a project is not so important as the unit cost.

It is natural for the unit costs to rise and fall inversely with the size of the facility. Generally speaking, however, the cost curve tends to become asymptotic as it approaches a lower limit of unit cost in the area between 2 and 3 million bushels of space. One would expect that, on an economic basis, all storage would therefore fall into this range. This would be true except for other economic factors such as the type of operation intended, the size (limitations) of the market, and the percentage of the market which is available to the operator of the facility. For example, a 2 million bushel storage would be small in the City of Minneapolis, but it might loom very large in a rural town with a few thousand population.

In recent years, the soaring cost of building conventional grain storage, when considered in relation to the large volume of grain already in dead storage has created a trend away from the conventional storage pattern. More economical forms of storage are being sought in an attempt to adjust to the realities of the market place. Each year a number of fresh ideas, some from within and some from outside the trade, are introduced in the hope of solving the storage problem in the most economical manner. Many of the ideas have some merit, but for the most part, the economy comes from giving up something which the advocate of the idea deems least important. No one has yet devised a system for producing cheaper conventional storage without omitting essentials.

The question of whether conventional storage is necessary depends upon the operation. The answer must come from the operator, based on his own judgment. It is never worthwhile to build an unused function into a project, but a degree of flexibility is essential in any commercial operation. It is true that a dollar saving can be made for each function or factor that is omitted. However, the decision to accrue initial cost savings at the cost of impaired plant utility or flexibility is squarely up to the operator.

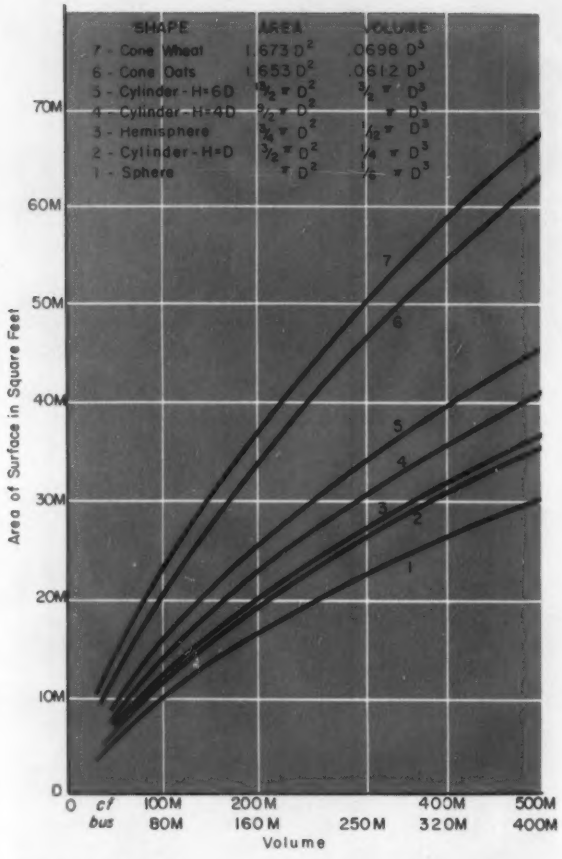
The Geometry of Grain Storage

It may be proven geometrically that certain solid shapes have greater volume in relation to the surface area than have other shapes. While some shapes present more difficulties in erection than others, tentatively it may be said that the relative economy of a structure is indirectly related to its volume-area ratio. For any given volume, a sphere requires the least surface. A cylindrical tank, of height equal to diameter, is next most economical, and a cone shaped structure least economical. If this were the only consideration, one might conclude that all cylindrical grain tanks should be built with their height equal to their diameter or should be spherical shells. However, other practical factors modify the shape aspect. A grain storage purchaser buys volume but pays for surface.

Conventional storage today is made up of cylindrical tanks having a height between 4 and 5 diameters. This is usually the most efficient way to build concrete storage. Slip forms are used in the construction,

Construction of a grain storage elevator, showing slip forms in place on the ground. Ralston-Purina, Decatur, Ill.

An aerial view of construction at a multitank storage elevator. Slip forms will be raised as the concrete hardens.



Relation of surface area to volume for different shapes.

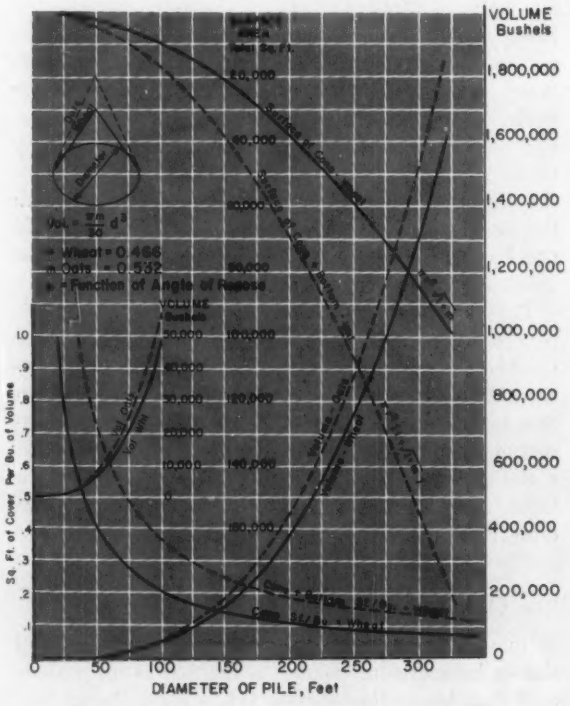
and although the greater height uses more material, it offers a great advantage in continuous form use. Steel tanks are usually more economically constructed when the height equals the diameter. This requires less material for the same volume, and construction is easier at moderate heights above the ground. The height of the storage and the soil bearing value will dictate the area of the foundation required for a given volume, and this will have the greatest effect on the total unit cost.

At present, normal volume for a single bin ranges between 10,000 and 50,000 bushels. When one considers storing grain in one pile which may contain 500,000, a million, or a million and a half bushels, it is a completely new concept of grain storage. One of the ideas which has caught the fancy of the grain trade recently has been the storage of grain in tents, or tent-like structures which cover conic piles of great volume. This idea was motivated by economy. The question is whether the solution gives that economy.

The grain trade has shown a marked interest in these large volume storages because the cost is represented as being between 20 and 30 cents per bushel. This figure is misleading, for while it is true that the initial cost of providing storage has been reduced, the ultimate cost must take into account operational and maintenance costs. There is a basic risk incurred in storing grain, and one million bushels of grain in a single pile is a greater risk than an operator normally wishes to assume. The cost of conventional grain storage seems cheap by comparison for those who have tried this large volume method and failed. It might be stated simply that the price of grain storage is inversely proportional to the risk you wish to take. You could just pile it on the ground and hope for indefinite good weather.

In this regard, it can be pointed out that the foundation of the structure is no place to attempt to cut costs. Those who have tried to save money here have invariably met with failure — sometimes disaster. Of course, there are those who have tried to save money by skimping on the superstructure, and they too have met with failure. But superstructure failure can be seen and repaired. The repair is costly, but it is the price of a lesson that has to be learned.

Should a foundation fail, there is no safe way the building can be made completely reusable again, (and still allow the owner to sleep at night). It is imperative to make certain that those building the facility, and those responsible for the payment, are cogni-



Measure of grain in conic piles at normal angle of repose.

zant of the total costs for a properly designed structure, and realize that such costs are necessary. Then, if they wish to reduce those costs, it can be frankly stated that the only way money can be saved in the design of a grain elevator is to omit part of the facility wanted, or to reduce the storage volume. The unit cost, of course, will go up, but dollars will be saved.

Conveying Capacity

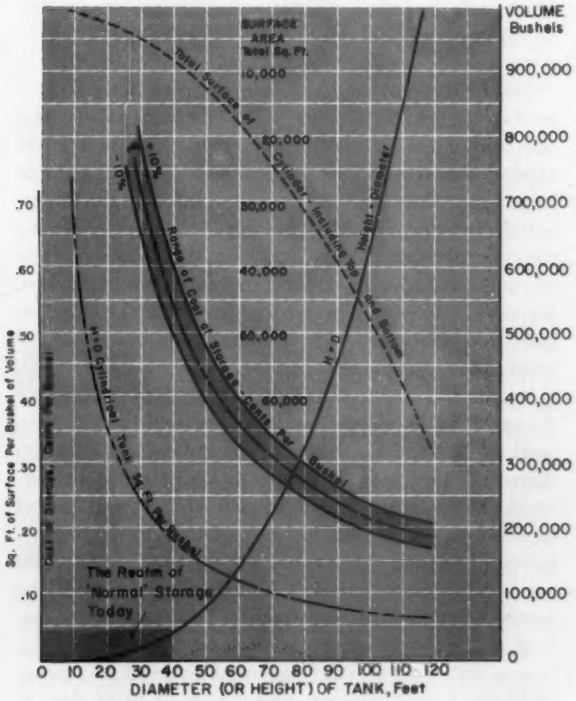
Every storage facility must include a method of moving the grain in and out with reasonable speed, and a method of storage that will prevent deterioration.

The amount of mechanical equipment that would permit a reasonable transfer of grain is proportional to the volume which is stored. Under conventional operating conditions, the capacity of the conveyor belts and the elevator legs will vary in relation to the storage capacity of individual bins. On the other hand, it is not unusual to have conveying equipment with a capacity of 10,000 bushels per hour in a facility with 20,000 to 30,000 bushel bins. Some of the faster houses have legs and belts with capacities up to 30,000 bushels per hour.

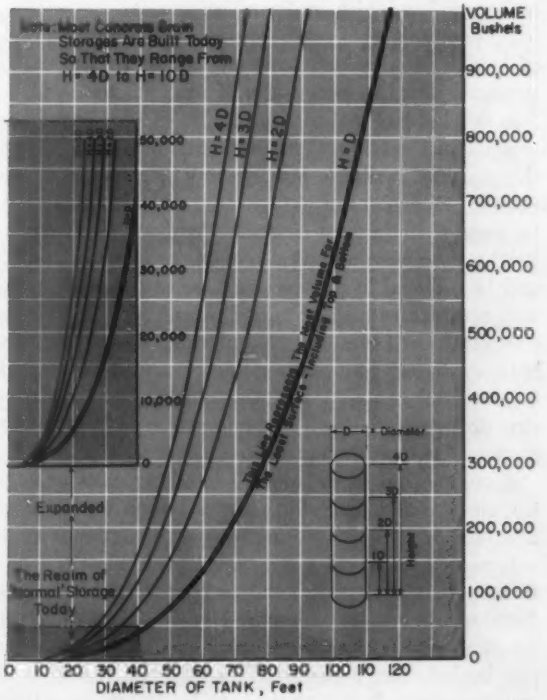
The largest bin in a conventional storage has a capacity of about 50,000 bushels. The lowest desirable ratio of conveyor capacity to bin capacity is 20 percent, which would require a 10,000 bushel per hour conveying system for a facility which has a 50,000 bushel (maximum) bin capacity. From this it is apparent that the tank could be emptied, or could be turned, in five hours. Using this same ratio, a million bushels of grain stored in one pile will require a conveying system capable of a fantastic 200,000 bushels per hour, irrespective of the type of cover or the geometric shape of the pile.

To get back to the realm of reality, the largest conveying system has a capacity of approximately 30,000 bushels per hour, and it would require 33 hours to empty or turn the contents of a container which has a capacity of one million bushels. Rapid movement of grain is one the most difficult problems to overcome in large volume storage. While the loading capacity might reasonably be limited to 10,000 bushels per hour, and the unloading facilities to 20,000 bushels per hour, mechanical equipment must have sufficient reserve to handle larger volumes properly in times of emergency. As larger equipment is provided, the cost goes up accordingly – thus, the great economy of large volume storage first indicated will disappear.

A second general requirement of a grain storage is that the cover be of such material that it serves as protection against heat, moisture, and the forces of nature, such as wind and storm. The latter possibility must be considered in relation to the worst conditions that have been recorded historically in the area where the storage is to be constructed. While it is possible



Cost of storage in cylinder, where height equals diameter.



Storage capacity for varying ratios of height to diameter.

to design a steel or concrete structure to resist the worst conditions – say a 100 mile an hour wind – and still maintain a reasonable factor of safety, it is questionable whether one could economically design a flexible structure, such as a tent, to withstand these stresses in a partially empty condition. Again, something is given up – in this instance the safety factor.

The primary storage problem is to keep the grain in good condition, assuming that it was placed in storage that way. Basically, this requires that it remain dry and cool. Average moisture in the bin cannot be relied upon. This is well illustrated by the sad story of the statistician who drowned crossing a river that averaged four feet in depth. Invariably, the moisture moves from the warmer grain at the center of the bin to the cooler grain at the surface layer when the outside temperature falls. The migration of moisture is lessened by using bin shapes which have low surface to volume ratios, and by constructing the storage of materials with good insulating properties.

It is necessary, in considering the design of a grain storage facility, to take into account certain operational factors. This is particularly important if the facility is to be used for the merchandising of grain, as opposed to the dead storage of the commodity. For example, consider grain that is stored in a conical pile in a flat-bottomed bin, with a hole in the center for unloading. By simple geometry it can be shown that only 25 percent of the material will be free flowing, and the remaining 75 percent will have to be manhandled in order to remove it.

By comparison, if one assumes a flat bottomed tank of height equal to its diameter, it can be shown by geometry that the proportion of material that will be free flowing is equal to $1 - (\tan a \div 3)$. If wheat is under consideration, the result is that 84⅓ percent of the material will be free flowing, leaving approximately 15⅔ percent of the material to be manhandled. Of course, if the tank is more than one diameter in height, the percentage that remains to be manhandled will be reduced in proportion. In most terminal elevators, hoppers are placed in bottoms of bins so they are completely self-cleaning. Hoppering, however, costs between 5 and 10 cents per bushel, and it is omitted in so-called economical storage to reduce the construction cost. The use of hoppered bins is the best method for handling grain.

A comparison of the manual handling costs of conical storage and tank storage in a billion bushel storage facility is worth noting. Every time the storage volume is turned, one must take into account the difference in the cost of manhandling 750,000 bushels (conical storage) as compared with 155,000 bushels (tank storage). Figuring a minimum value of ¼ cent per bushel, the operational expense of the conical structure exceeds that of the tank by $3000 every time the volume is turned. Turning the volume 10 or 12 times a year is not considered abnormal, and some elevators have turned their volumes more than 20 times a year.

Storage in a conical pile requires greater conveying lengths than if the material were stored in a tank whose height equaled its diameter. For example, 400,000 bushels would form a cone with a diameter of 200 feet, and if the material were wheat, the pile would be approximately 47 feet high. The necessary elevation for loading and unloading to convey from the edge of the pile to the center, and vice versa, would require mechanical equipment consisting of approximately 200 feet of conveyors, plus a 50-ft elevator.

To store the same 400,000 bushels of grain in a cylinder (height equal to its diameter) would require an 87-ft tank. In this case approximately 87 feet of conveyors and a 90-ft elevator would be required. Thus, 73 feet, or 40 percent, of conveying equipment could be saved by the use of the cylinder.

There is room for improvement in the design of grain storage, and our present "conventional" storage is not the ultimate in economy or efficiency. Actually less progress has been made in this field than in many others, since the purchasers of grain space tend to think in terms of capital investment only and to ignore operating expenses. With rising labor costs, the operating expense is beginning to be a major factor. The automatic, pushbutton elevator is just a speck on the horizon, but some day it will become a conventional unit. There is no doubt that full automation will require new layouts; and perhaps new structural materials, theories, and designs will be developed to make it possible.

One of the reasons that grain elevator designs have trailed design developments in facilities of similar size and scope is that there has been no real effort expended in research or development. There is not one large grain firm that has any sizable program for research relating to the handling and storing of the commodities that it buys and sells. If only a moderate research and development program were instituted, the cost of it would be returned many times over by increased efficiency, lower operating expense, and greater use of expended capital.

Research is required to develop standard methods of design. Until we have standards, we will have to proceed somewhat in the manner indicated, although there certainly is nothing sacred about the path outlined. Many structural and economic factors affect the design of a grain elevator. Often the economic factors promote designs which are not structurally nor operationally sound. Above all, it should be stressed that for a given facility, costs are truly lowered only by eliminating something, and the foundation is no place to start making this kind of saving. Until we have a proven, accepted method of design, we must stay on the conservative side. ▲▲

Engineering Productivity . . .

What's Wrong With Money As a Measure?

JOHN GIRAND Johannssen and Girand

A CONSULTING ENGINEER's office can be defined as "a monster that devours large quantities of cash each month." Certainly, anyone who has held a position of financial responsibility in a consulting engineer's office soon appreciates that there must be cash in the bank every two weeks for the payroll and other expenses.

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When paydays come up with monotonous regularity, and clients get tougher and tougher with payment clauses ("The owner withholds 10 percent of the design fee until construction of the project is completed. . . ."), the man with the financial responsibility can be pardoned for wondering just what he is getting for the money he spends on engineering salaries.

Manufacturing concerns and turnkey construction firms can add to the cost of their product the very small percentage they spend for engineering. But the consulting engineer does not have a product onto which he can tack the cost of engineering services. Therefore, he may be excused for not taking too seriously a report from the American Management Association, noting that, "The easiest way to waste engineering personnel is to have them work in poorly equipped laboratories; to crowd them together in noisy, substandard working quarters; or to scatter them so they cannot communicate adequately with each other." On the basis of long experience, with a consulting firm that will soon celebrate its 50th anniversary, I suggest that the easiest way to waste engineering personnel is to have them working on nonproductive jobs. One engineer working in crowded, noisy, substandard quarters on a productive job is worth 10 doing busy work in a chrome-plated aircraft factory on cost-plus contracts.

So, the problem seems to resolve itself to one question: What constitutes productive work?

Before we tackle this tough one, a brief detour into the realm of poetry and philosophy might broaden our outlook. The poetry is a quotation from Ogden Nash:

"This is a song to celebrate banks,
Because they are full of money and you go into them and all you hear is clinks and clanks,
Or maybe a sound like the wind in the trees on the hills,
Which is the rustling of the thousand-dollar bills.
Most bankers dwell in marble halls,
Which they get to dwell in because they encourage deposits and discourage withdralls,

And particularly because they all observe one rule which woe betides the banker who fails to heed it,

Which is you must never lend any money to anybody unless they don't need it.

But please do not think that I am not fond of banks,

Because I think they deserve our appreciation and thanks,

Because they perform a valuable public service in eliminating the jackasses who go around saying that health and happiness are everything and money isn't essential,

Because as soon as they have to borrow some unimportant money to maintain their health and happiness they starve to death so they can't go around any more sneering at good old money, which is nothing short of providential."

Is anything wrong with "good old money?" If you have to have a large quantity of it every two weeks to meet the payroll, is it such a disreputable commodity? If it is so disreputable, why do employees raise so much cain when the payroll clerk is one day late getting out their paychecks?

Then we agree; money is not disreputable after all.

So much for the poetry – now the philosophy. There is a story told about the Graduate School of Business of an old and respected American university. According to the story, a question on every final exam is: "What is the purpose of a foundry?" Anyone who answers that the purpose of a foundry is to make iron castings is automatically flunked. The purpose of a foundry – as anyone should know who has spent two years in this old and respected Graduate School – the purpose of a foundry is to make money.

Recent investigation seems to indicate that successful consulting engineering firms require half of their annual income to cover indirect costs. In that case, what is wrong with asking each project manager to keep his direct project costs to within half of the total income?

Enter the Hero

Most consultants assign one man to handle each project. In smaller firms it may be the owner himself, and in larger firms it is usually some individual with special competence in the job field. This man, regardless of his ownership or nonownership status, we will call the project manager.

This project manager, with whatever expressions of envy or sympathy he may receive from his coworkers, must deal with the client on the problem of establishing a fee. He must estimate how many engineers, technicians, computers, stenographers, surveyors, meter readers, and specialists must work for how many months to perform a service for a client who cannot or will not take the time to write a complete and accurate scope of the work.

Our hero now comes up with a project estimate of payroll dollars, and, when he thinks of it, he adds other direct charges, blueprinting, travel, and lab fees. This gives a figure which is his guess about the amount of good old money required to cover the cost of doing the job to the professional standards of his firm.

Enter the Villains

The project manager has no control over the indirect job costs – front office salaries, rent, insurance, and so on – and therefore can only take the figures given him by the comptroller to add to his direct cost estimates. Most project managers object violently to these front office surcharges, apparently preferring to work in a tent rather than an air conditioned office. The project manager's fiscal responsibility should be restricted to those items which he alone estimated.

To a member of a consulting engineering firm who has the financial responsibility, it is most surprising to learn how little engineers really know about the cost of engineering. On almost every job the engineering team comes up with a reasonably accurate forecast of the construction cost of the job, yet this same team is usually unable to come up with anything near a reasonable forecast of the engineering costs.

Northcote Parkinson long ago explained the laws that apply to stretching out the job to make it last as long as possible. Yet few project managers realize how easy it is to get a job to 95 percent completion and how hard it is to get that last 5 percent finished.

A new project manager rarely understands the importance of Finagle's First Law of Revision:

> "Information necessitating a change in design will be conveyed to the designer after, and only after, the plans are complete. (Often referred to as the 'Now they tell us' law.)"

When this happens (and it does, inexorably as the tides) it not only gives the design engineer fits but it also smears red ink all over the cost records.

The Plot

When the project manager has his estimates in final form, they should be put in chronological sequence and entered on a form such as Fig. 1. On this sheet, the contract data, engineer's estimated progress, and other pertinent information are entered.

This sheet is retained by the project manager until the end of each month, when he enters in "Actual progress" his estimate of the percent complete and turns the sheet in to the payroll clerk. At the beginning of the next month, the clerk returns the sheet with costs and "Remaining balances" filled in.

When his sheets first come back, a new project manager usually is shocked to learn how fast his "Remaining balances" are dwindling. It frequently takes

years of experience at the project manager level for an engineer to learn that his real enemy is time:

¶ Time spent waiting for the review board. (The longer they hold plans for review, the more changes they can think up.)

¶ Time spent in conferences. (A conference is a meeting of people who decide to refer the problem to the wrong person.)

¶ Time spent erasing drawings. (One supplier claims his paper will stand 10 erasures!)

For every job there is an alibi, and a consulting engineer soon feels like a judge – he thinks he has heard all the excuses. When a project manager comes up with a novel excuse for his job's losing money, he can go home with a light heart – in spite of the job's being $6842.37 in the red.

To give the project manager a break, a summary of all jobs under his jurisdiction is prepared, as shown in Fig. 2. When, say, all six of the jobs assigned to one project manager are in the red, he has to have 36 times the ingenuity to alibi all of them away.

A consultant with 10 project managers under his jurisdiction will, perhaps, want some kind of summary sheet. Fig. 3 will do as well as any, and can go far toward disavowing the young and uneducated college graduate of the notion that consulting engineering is an unlimited gravy train.

The Moral

Not many consultants can afford the luxury of project managers who consistently underestimate the cost of the engineering required on the job; who never can get the job completed; or who insist on engineering the job to death.

So, as a measure of productivity, what is wrong with "good old money?" Let anyone who quarrels with this idea volunteer to skip a few pay days. And if anyone asks about professionalism, remember I said "doing the job *to the professional standards of the firm.*" ▲▲

PROJECT MANAGER Tesla PROJECT Runway Extension B/Taxiway/Lights - $1,220,000

ENGINEER'S ESTIMATED PAYROLL COSTS	$ 28,000	DATE STARTED: Feb 1959
ESTIMATED OTHER COSTS	2,500	DATE COMPLETED
ESTIMATED TOTAL COST	30,500	CREDIT INFORMATION: Payments slow - usually 60/90 days after billing

ENGINEERS ESTIMATED PROGRESS

1959	FORWARD	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
PAYROLL	$ 20,000	2,000	2,000	2,000	1,000	500	300	200	0	0	0	0	0	$ 28,000
OTHER	$ 1,800	300	300	300	300	300	0	0	0	0	0	0	0	2,500

ACTUAL PROGRESS

Dec 31, 1959													
PAYROLL	$ 22,383	2,184	2,640	1,862	2,384	1,216	737	810	484	260	390	65	65	$ 35,400
OTHER	1,448	642	215	66	30	10	269	99	18	0	35	0	18	2,770
% COMPLETE	95%	96%	97%	97.5%	98%	98.5%	99%	99.1%	99.2%	99.3%	99.4%	100%	100%	100%

REMAINING BALANCES

PAYROLL	$ 5,617	3,433	793	-1,069	-3,453	-4,669	-5,406	-6,216	-6,700	-6,960	-7,350	-7,415	-7,480	$(7,480)
OTHER	1,052	410	195	129	99	89	-180	-215	-225	-225	-260	-260	-278	(278)

REMARKS:

CONTRACT DATA
NOTICE TO PROCEED May 10, 1959
COMPLETION DUE May 10, 1960
BILLING CLAUSE 30% Prelims
60% Finals
10% As built

BILLING DATA:
DATE: AMOUNT $

ON 93F

Fig. 1 – Project manager's monthly job report, showing typical entries.

PROJECT MANAGER BOBBYS SUMMARY FOR MONTH OF February 1961

Job No.	Name of Project	Latest Est. Fee	Percent Complete: Last Mo.	Percent Complete: This Mo.	Percent Complete: Increase	Increase in Fee	Payroll x 2	Productivity
WO 402	Calle Garey Miscellaneous	764	47.2%	100%	52.8%	404	64	340
WO 404	Verde-Loco	1,620	100%	0%	0%	-0-	-0-	-0-
990	Avia I. D. No. 1	8,322	72%	100%	28%	2,365	420	1,945
2005	Bartlett Aud. I. D.	9,226	80%	0%	0%	-0-	78	(78)
2011	Harlequin Toonsite	724	100%	0%	0%	-0-	-0-	-0-
2027	Pharoh Saver I. D.	22,435	85%	90%	5%	1,122	1,426	(304)
2033	Agua Racetrack	675	100%	0%	0%	-0-	-0-	-0-
2035	Avia I. D. No. 2	7,773	55%	80%	25%	1,938	808	1,130
	TOTALS	51,539				5,829	2,796	3,033

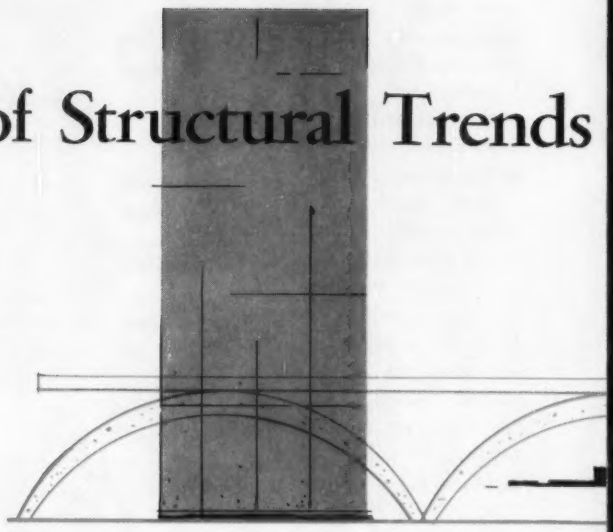
Fig. 2 – Monthly summary of jobs under control of one project manager.

PRODUCTIVITY SUMMARY - 1961

PROJECT MANAGERS	JAN.	FEB.	MAR.	APR.	MAY	JUN.	JUL.	AUG.	SEP.	OCT.	NOV.	DEC.
Bronsff	2,705	(1,203)										
Doer	514	108										
Digget	1,463	234										
Girard	(348)	(123)										
Harris	(1,730)	3,033										
Hestia	(1,099)	(529)										
Phillips	618	121										
Tesla	(1,520)	(2,706)										
Tool	336	679										
Woodstock	(2,709)	(276)										
Miscellaneous	(1,052)	(1,024)										
TOTAL	(2,822)	(1,686)										

Fig. 3 – Summary report of the managers' financial productivity.

An Analysis of Structural Trends



SINCE THE LAST war we have seen many changes in the building industry, involving new structural forms, new materials, and higher design stresses in some basic materials. This has been possible because of closer job control and more uniform processes.

CE exclusive

In an effort to reduce or at least stabilize building costs, new and sometimes cheaper materials have replaced traditional products. For example, concrete block has largely replaced brick and terra cotta. While the block may be strong enough to support the imposed loads, we constantly are faced with the possibility of cracking, through shrinkage or other causes. While reinforcing in the joints helps to some degree, this problem probably will never be resolved completely. It is an important factor in design, especially for walls of considerable expanse.

When steel joists were introduced, floor flexibility took on new significance. Vibrating loads demand careful study, and the basic flexibility of open web joist floors may require special treatment. On many projects our office has provided joists deeper than indicated by the loads, simply to dampen the vibrations created by fairly heavy pedestrian traffic.

These are only two random examples of materials that have been in use for some time which still require careful consideration in structural use. There are many others, but of even greater importance are some of the newer materials, currently being used, that will become more popular in the future.

Concrete Research

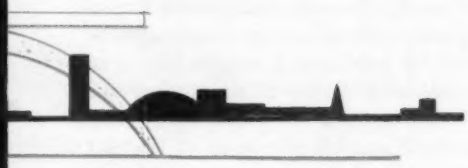
The last convention of the American Concrete Institute discussed the role of research in concrete, and found that, while some research is being carried on, much more is needed. Recent research and studies have led to proposals for revised formulas involving shear and diagonal tension. These formulas involve not only strength of the concrete, but also percentage of longitudinal reinforcing and ratio of moment to shear. Surprisingly enough, in 1909, Talbot concluded, on the basis of his tests, that these variables should be considered. However, it appears that the consideration of all variables disappeared, leaving only the strength of the concrete. The latest investigation was sparked in 1955 by the failure of some rigid frames supporting a warehouse roof in Shelby, Ohio. Incidentally, the design of these frames satisfied all provisions of the 1951 ACI Code.

An excellent paper by Professor C. P. Siess in the May 1960 *Journal* of the ACI, entitled "Research, Building Codes, and Engineering Practice," gives an interesting discussion of the relations between practice, research, and codes. He shows how certain code specifications have been developed through successful experience records, others through research. Shear requirements of the ACI Code have not changed significantly in 30 years. This indicates that, in spite of a tremendous amount of research on this particular item prior to 1928, we have failed in interpretation or simply overlooked certain significant results. Since shear failures are usually sudden and disastrous, we should not try to economize on this phase of the design. Flat plate design, now universal in use, makes shear evaluation at columns the critical area in determining the slab thickness. In a vital design area of this nature we should be doubly sure that our criteria are safe. Shear evaluation appears to be the weak link.

Lightweight Concrete

The use of lightweight aggregate for structural concrete has increased tremendously in the last 15 years.

HAROLD S. WOODWARD
Seelye Stevenson Value & Knecht



It is economical in many multistory buildings where weight reduction is a factor, due to foundation conditions, or where other considerations make its use desirable. Although this material passes strength requirements, it has introduced many related problems which have to be solved. Getting a workable mix may be a problem — however, not a difficult one. Two other characteristics are not so easy to cope with and may have to be given special consideration. These are the low modulus of elasticity and plastic flow.

The low modulus of elasticity of lightweight concrete makes deflection a problem. In an ordinary run-of-the-mill job there may be no difficulties on this point. However, if there are long spans with shallow sections or large cantilevers, troubles may be encountered. There have been conditions where long cantilever slabs have been required for architectural reasons. Often, workmen have complained of vibrations during construction, immediately raising the question of safety. Even if the slab meets strength requirements, it may be too limber. It then is necessary to set up some arbitrary ratio of slab depth to span for the next job, to reduce this questionable vibration to a safe level.

Plastic flow is characteristic of all concrete, but it is more pronounced with lightweight aggregate. Plastic flow deformation has been experienced in thin shells with hyperbolic paraboloid roofs. Another example is the long cantilever slab. If a curtain wall is built at the edge of the cantilever with an insufficient adjustable clearance in the connection between the wall and roof slab, plastic flow eventually may cause deflection. This will transmit part of the roof or floor load to the walls, and cracking of the curtain wall as well as the roof slab may occur. To resist plastic flow, it is advisable to provide additional reinforcing in the compressive face, if the depth of beam or slab is sufficient. While sand has been used in the fine aggregate to raise the modulus, it increases concrete weight, defeating its own purpose.

High Strength Reinforcing

Successful applications of high strength reinforcing have been made in Europe for some time, but use in the United States has been limited because of code restrictions and insufficient test data and research. Occasional cracks due to bond failure have been considered unavoidable. However, the situation may change as better reinforcing steels, with minimum yield points of 60,000 and 75,000 psi, become available. Tests recently made indicate that crack widths can easily be kept within reasonable limits, and that reinforcing under high stress does not cause any significant reduction in shear strength.

Using the elastic theory without considering bond or shear, we find that for the same concrete working stress and moment the value of k is reduced and j increased when 50 percent higher stresses are allowed in the reinforcing steel. This results in a larger required value of effective depth with greatly reduced steel area. As the working stress of the concrete is increased, the effective depth may be reduced slightly with a proportional increase in required steel area. Of course, the stronger the concrete, the less depth required, until a point is reached where deflection is the determining factor. With higher concrete stresses and shallow beams we should also consider what effect plastic flow could have on deflection after four or five years. It might be advisable to use an n value of 40 to 50 instead of, say, 8.

More research appears to be necessary before final recommendations are published. Also, until more practical applications have been made and field results on actual jobs evaluated, we probably should not proceed too fast. Practicing engineers are frequently harassed at present with inexplicable cracks in concrete. Present concrete techniques, both in office and field, need to be improved on the basis of our present knowledge before we accept higher stress design in both concrete and reinforcing.

Prestressed Concrete

Although prestressed concrete has been in use in this country for several years, reports on the experience record of installations are limited. Evidently there have been few serious difficulties, or else reports have

not been circulated widely. Perhaps the time is too short, but a general survey of existing installations would be invaluable to design engineers.

Experiments conducted at the University of Illinois have raised questions regarding current design practice. Test results there on post-tensioned members indicate that draped strands actually decrease the shear strength, and seem to permit earlier formation of flexural tension cracks which can become diagonal tension cracks. Since shear is a most vital element of post-tensioned concrete, there is cause for some concern. There is need for more research work before we can assume that all our theoretical or design assumptions are the best that can be devised.

The allowance made between initial and design tensile stress also may be questioned in actual practice. For example, on a flat plate floor slab for a hospital, with the post-tensioning wires in place, it was observed that, by the time all the outlet boxes, inserts, and other accessories had been located, the wires were making many reverse curves, instead of remaining in a fairly straight line. It is fairly certain that the allowance for friction was not closely approximated. Anyone who has checked his own work in the field knows that there can be quite a difference between the theoretical design and the actual work.

Recent engineering publications are recording more and more pretensioned and post-tensioned prestress jobs of all kinds. Whether many can be justified economically may be debatable, but this trend will probably continue. There also will be increased use of ordinary precast concrete due to the reduction in field form work, shoring, and other high cost labor items. New thoughts, new materials, and new systems will be pursued continually to reduce costs. While engineers should always welcome these innovations, they should be cautious about prematurely accepting those not backed up by adequate research and field experience. No matter how much research is conducted, there is still much to be learned from field experience over a period of years.

High Strength Structural Steel

The use of high strength structural steel for special situations in bridge work is already a fact. Its higher cost may be balanced against the lower tonnage required with favorable results. However, in building work, it has had little use to date. It appears that it should be considered for columns in multistory buildings and for large trusses where either weight or size is an important consideration.

High strength steel provides two important advantages over structural carbon steel. It has a high yield point and superior resistance to atmospheric corrosion. The yield point of the steels that would be used for most structural work is 50,000 psi or 50 percent above that for structural carbon steel. Corrosion resistance was achieved through the development of grades that progress through copper steel to the high strength, low alloy steels, and, finally, to the stainless steels. The relative resistance to corrosion cannot be expressed precisely in quantitative terms, but it ranges from four to six times the corrosion resistance of carbon steel.

The design practices used with structural steels can be followed for the high strength steels, but with two important reservations: buckling problems with thin metal, and elastic stability of columns and struts. The use of I-shaped sections, formed from light gage sheets spot-welded together, has been increasing in recent years. With the thin wide flange sections, buckling becomes critical in the compression flange. Tests have been made, and design recommendations for these conditions are now available. For columns and struts, a nonstandard column formula is used. Comparing column savings that might be utilized, an l/r of 60 produces a weight saving of 45 percent and an l/r of 120 saves 25 percent, when a 50,000 psi yield stress is used.

The modulus of elasticity is the same as that for structural carbon steel, so deflection is not a particular problem if we consider the depth span relation. Welding creates no problems, as the development of this material took welding into account.

The three economic factors to be kept in mind in considering the use of high strength steel are:

¶ Minimum cost per unit of strength

¶ Minimum cost per unit of service life

¶ Minimum over-all cost due to operating savings and lower maintenance. This applies principally to the construction of transportation equipment.

In considering the erected cost of high strength steel, there are other factors than the basic cost, which presently is about 50 percent more than structural carbon steel. These factors include shipping, handling, and erection charges. If this price spread is reduced in the future, there is no doubt that the use of this material for structural work will increase, especially in the building field.

Composite Construction

Composite construction is a fairly recent development for building work, although it is quite an old story for bridges. In this system, shear connectors give true composite action with the slab. Tests are still being made to see how theory coincides with practice.

In our office we have been conservative in using an n value of 10 for the spacing of the shear connectors. In highway work an n value of 10 for live load and 30 for the dead load is used. The value of 30 is used to allow for creep over a period of time.

Composite action seems to occur when the beam is encased in concrete, even when no shear connectors are used. Further tests on the action of shear

connectors are being made and no doubt the trend will be toward an ultimate design with fewer shear connectors. This phase is really the only new design approach for this system. However, further tests should be made to see if deflections check the theory.

The idea of a special type of rolled section, especially for composite construction, has been considered. This rolled section should be unsymmetrical, with only enough top flange for the attachment of shear connectors. Of course, it is possible to build up a welded section which would be economical.

Recent publications have shown how composite construction may be used with precast and poured in place concrete. Shear connectors in this case may be a combination of shear keys and stirrup loops cast into the precast concrete. There are so many construction conditions and details that may be worked out with this sort of combination that the engineer can exercise considerable ingenuity. An adhesive on the top flange of a beam also has been suggested.

All of these ideas will be tried out, and many others will be developed as time goes on. For the present, there is no reason for holding back on this construction system. It has been tried and tested over several years and has proved to be economical in many buildings where a concrete slab floor system is used.

Wind Bracing

There have been a few recent failures caused by insufficient wind bracing. While it is generally true that these have occurred during the construction phase, it raises the suspicion that designers may be getting a little careless — especially in regard to one-story structures such as shopping centers and industrial buildings. With multistory buildings the wind forces are usually carefully considered. In the past, the small buildings were generally the wall bearing type in which wind shears were taken by the walls. With modern buildings, using curtain walls of metal or masonry cavity wall construction, we are faced with a different situation. More and more of these low buildings are literally spread all over the lot.

The New York City Building Code appears to be somewhat weak in code provisions for wind. It states, "All structures 100 feet high or less should be investigated as to the need for wind bracing, but, in general, wind pressure in such structures may be neglected. All structures, 200 feet or less in height, in which the height is more than 2½ times the least width, mill buildings, shops, roofs over auditoriums or drill sheds, and structures of similar character, shall be designed to withstand an assumed wind pressure of 20 pounds per square foot on the upper 50 percent of their height." Under these code provisions, one-story buildings would require no wind bracing. However, there should be at least a 15 pound per square foot wind pressure resistance for any building. Not only should the structure be figured for strength, but some consideration should be given to stiffness.

The usual one-story industrial building with metal curtain walls, metal roof deck, and sizable plan dimensions has column bays that have had a tendency to get larger. In fact, 40 to 50 feet is common. The roof deck, acting as a diaphragm, is assumed to distribute wind load to either the columns or to the side walls. If the latter, it probably will be necessary to add a supplementary diagonal or truss system under the roof purlins. The side walls then will have to have a bracing system to take the wind loads to the foundation. If the wind is taken at each column, provision for some sort of moment connections will have to be made to take the wind load into the columns, which in turn have to be figured for the wind moments. Special consideration has to be given to an expansion joint in the center of the building.

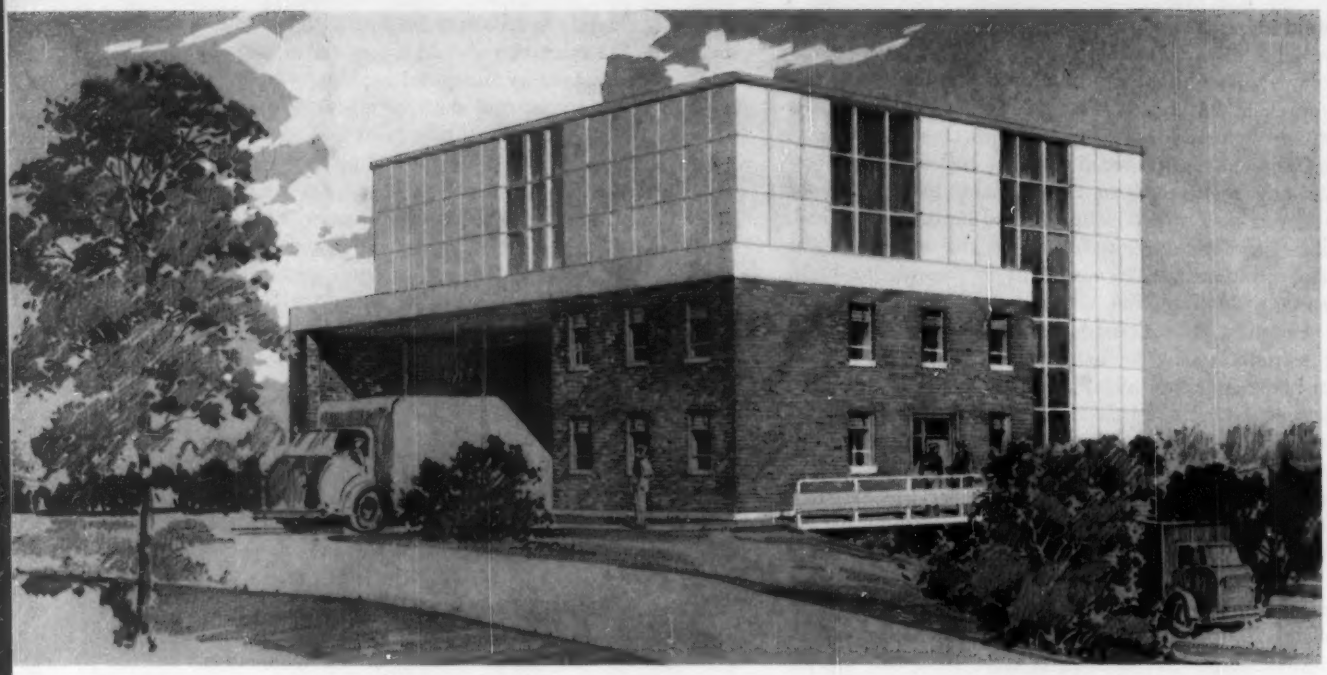
These practices are elementary, but they are mentioned because of recent oversight or neglect on the part of some engineers. If the wind connections are not at least partially attached during the construction phase, temporary guying is necessary. If the sidewalls are adequate to take the wind shear, proper connection between the roof deck and sidewalls is necessary to transfer the wind loads.

One other precaution should be mentioned in connection with curtain wall systems which feature large window areas and metal panels. The metal mullions should be checked for the wind load. These often have considerable heights or spans and are fabricated with a slip joint for thermal movements. While this is principally an architectural item, it is the responsibility of the engineer to see that the manufacturer is providing adequate strength and stiffness. The engineer should assist in architectural details whenever these details involve safety.

Research vs. Field Proving of Materials

To quote again from Professor Siess, "Ideally, we should never have failures, at least not those attributable to deficiencies in the code. Codes are not infallible, even when based on research, since research itself is not infallible. Research is not infallible primarily because it is never complete; that is, although laboratory tests permit more careful control of the variables than is possible in the field, the number of variables included in tests is usually smaller than the number in the structure."

There is no better way of saying that new materials, high stresses, and new systems should be viewed with caution, even though tests and theory indicate safety. Research is vital but should not be considered final, for it may not have been interpreted or applied correctly. Field experience over a period of time, under many conditions of service, is really the final proof. ▲▲



The front view of an incinerator which was designed by Hayden, Harding & Buchanan for the City of Beverly, Mass.

Garbage Can Burn Clean With Engineered Incineration

WILLIAM H. McGRATH
Consulting Engineer

THE DISPOSAL of refuse has become a problem of serious proportions in many urban communities. People are not willing to accept the unpleasantness of open dumps, and frequently they are dissatisfied with sanitary landfill operations. The prospect of eliminating the problem by destroying refuse through self-combustion has so appealed to community leaders that they have on many occasions accepted construction proposals which set profit above performance. They soon discover that they have taken title to a fuming monstrosity, belching dust and odor, and subsisting mainly on generous infusions of cash. There is no reason why any community should have to put up with poorly-designed disposal facilities.

CE exclusive

While there are no easy rules of thumb by which a community can solve its own refuse problems, our engineering knowledge of combustion makes it not only possible but practical to design and install incinerating plants that offer predictable performance. Since refuse disposal problems vary from community to community, it is mandatory that the services

of a qualified consulting engineer be retained to insure adequate, economic, and nuisance-free design of an incinerator for municipal use.

Refuse Accumulation Terminology

It is important to express refuse accumulation in terms that are meaningful to the incineration processes. For example, weight of refuse, by itself, is an inadequate criterion, and often it is misleading. The following items encountered in refuse accumulation can be expressed in pounds of equivalent pure dry ash-free cellulose per hour of incinerator operation (PCH):

¶ Household refuse per capita per day.

¶ Commercial refuse per dollar of average gross business per day.

¶ Industrial refuse, if accepted for destruction by the incinerator plant, in a specific quantity per week as determined by survey.

Other refuse accumulation factors that must be considered include:

¶ Incombustible residue expressed as a percentage of total PCH. This can be approximated from residue data from incinerators serving similar communities, supplemented by a careful study of data on the community itself.

¶ Production of water refuse as determined by summarizing the moisture content by weight of the principal refuse constituents, either by direct survey or from reliable data. The production of garbage usually is known, and the amount of vegetable matter can be estimated within meaningful limits. The saturation effect of local rainfall also must be considered. The production of water refuse can be expressed as a percentage of total PCH.

¶ The gross volume of material that must be received and stored during any critical period. This is loose volume of material received during the period of greatest influx, minus the amount consumed by the incinerator during the same period.

¶ Special character of materials received. In general, most refuse is not finely divided, and the combustible portion is primarily cellulose. When finely divided material is present in significant quantity, the design must be modified to eliminate the hazards and difficulties of burning such material. When industrial material is accepted, careful control must be exercised to exclude hazardous materials which may be explosive or form poisonous vapors.

¶ Predictable increase in refuse amounts as the community grows.

Refuse Storage

Provision for storage of refuse on the site of the incinerator plant is heavily dependent on the ability of the community to dispose of refuse by alternate means. The cost of providing storage of total anticipated refuse accumulation at the plant must be weighed against the alternate cost of providing emergency dumps or other auxiliary facilities. Of course, the necessary accumulation period depends upon collection practices, weather, and actual plant design.

Although refuse can be delivered to a plant in a variety of vehicles, it is becoming common practice to employ compaction type trucks with capacities of 15 cubic yards or more. However, it can be expected that the material will recover most of its uncompacted volume, and that the density of refuse in storage will range from 8 to 10 cubic yards per ton. The types and number of vehicles, and their delivery frequency, establish the pattern for design of the plant, receiving facilities, and storage area.

Weather patterns also influence storage requirements. The frequency and duration of disruption of collections, plus the consequent need for crash refuse removal activity after such periods, have a bearing on plant capacity and storage facilities.

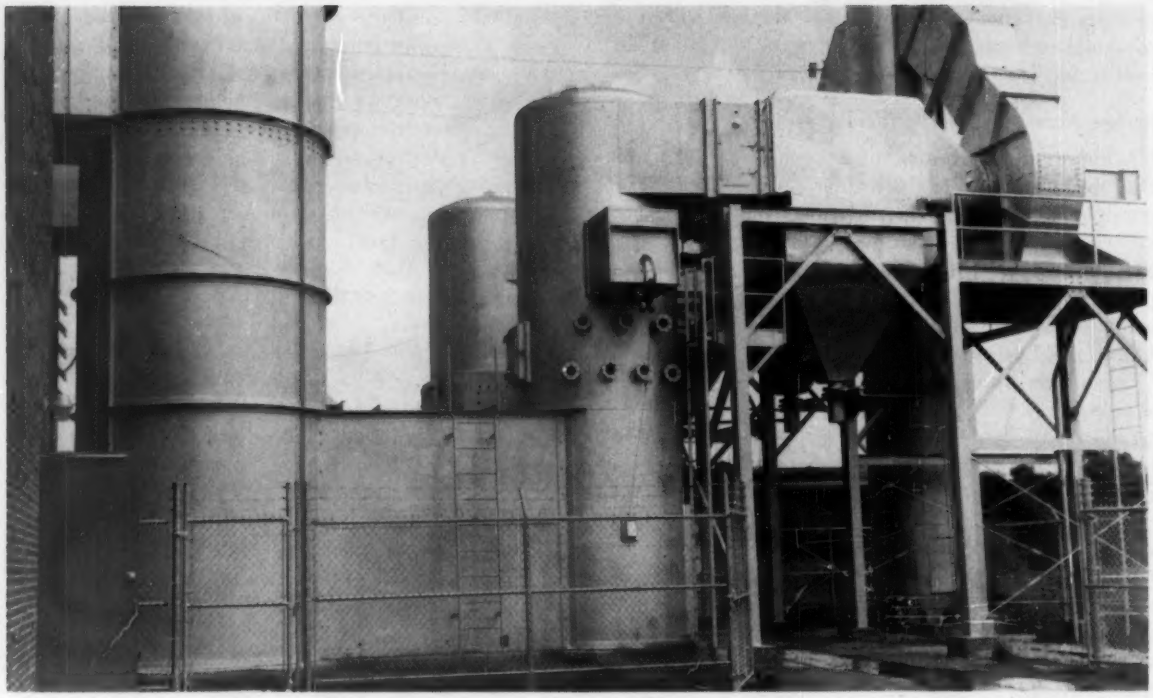
Storage requirements are affected directly by the rate at which the plant can process refuse during periods of maintenance or equipment breakdown — if it can do so at all. The effect of the breakdown or shutdown of each component of the plant has a predictable impact on plant operations. Plant design should consider the duplication of critical equipment, or an inventory of spare parts for such equipment as a hedge against breakdowns.

Refuse Handling

Provisions for handling refuse from storage are partly dictated by the type of stoking equipment selected for the particular plant. Some types utilize gravity charging, and others use rams or conveyors. The varied equipment in use today includes bridge cranes and monorail cranes equipped with clamshell or tined buckets, scrapers, front end loaders, conveyors, and skip hoists. Unfortunately, the conveyor industry has given little attention to incinerator applications.

Deep refuse storage pits appear to be economical, easily protected from accidental firing, and easily cleaned by flushing with water. They also allow refuse to be sprayed to eliminate dust problems. Thus, the grab bucket is used on most current incinerator plants because it can work a deep pit easily. It also allows mixing or selective removal. This facility of the bucket is highly desirable, particularly when potentially hazardous material is deposited in storage and requires special handling to isolate it from other materials to prevent combustion in storage.

Despite controls, items which could block or damage equipment are received, and these should be removed before charging the grates. Large wooden objects and furniture can be effectively reduced to easily handled sizes by battering with the bucket, before they are charged into the plant. An important value of being able to set aside material is that dry, easily



General view of the secondary combustion chamber, spray chambers, ash collectors, and draft fans at the municipal incinerator in Belmont, Massachusetts. This system was measured at over 90 percent dust arresting efficiency.

burned refuse can be used to kindle wet refuse, thus saving the cost of auxiliary ignition torches.

Ignition and Combustion

The following interrelated requirements govern in the procurement of optimum ignition and combustion in an incinerator plant:

¶ Start-up ignition must be prompt, and temperature rise to operating levels should be rapid.

¶ Fresh material entering combustion zones must be free of surface moisture and easily ignited.

¶ Air supply to the solid material on the grate, and to volatile materials above the grate must be flexible in both location and volume to meet changing combustion conditions.

¶ Refuse must be treated under proper time and temperature conditions to drive off volatiles, and there must be sufficient furnace volume where they burn.

¶ Correctly related grate area and time allowance for consuming solid materials must be provided.

¶ Controlled removal of gaseous combustion products is required.

Since these items are interrelated, there can be no easy, step-by-step design solution for a given incineration problem. Proposed measures often conflict, and since judgment is required, the community is justified in retaining the services of technically competent advisors to assure objective evaluation, selection, and design of equipment. Although particular rubbish materials may require consideration of specialized grate equipment, the proven equipment types generally will perform satisfactorily when they are installed properly, and supplemented, when necessary, with auxiliary equipment. Under these circumstances, the economics of the specific operation usually prevail.

Layout and Equipment Selection

Factors effecting layout and equipment are as follows:

¶ Source of refuse governs choice of ignition. Ordinary refuse from suburban households is generally dry enough to ignite with paper torches. However, where high moisture content is common and plant operation intermittent, oil or gas fired igniters may be required. Under abnormal conditions, where refuse is too wet to sustain continuous combustion, pre-drying equipment sometimes is required. The pre-dryer operates on waste heat from the furnace, but may require a supplemental heat source.

¶ Evaporation of surface moisture is essential to insure quick and continuous ignition of fresh charges to the furnace. Wet material may cause smoking since it lowers the temperature and the oxygen concentration of the burning material. The chemistry of this reaction is obscure, but it is well known that rapid

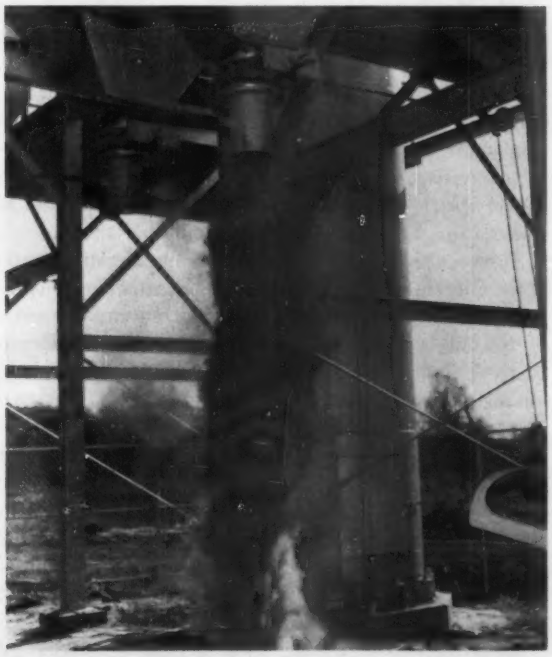
combustion of smoke (carbon) particles requires temperatures exceeding 2700 F to diffuse oxygen to the surface of the carbon. Gas is a poor conductor, hence the high surface temperatures of carbon particles must be sustained by radiation. Local chilling of the fuel bed will drop particle temperature, as will shielding it from radiation or pushing it from the area of reaction. A heavy smoke discharge may be created, even though chimney gas temperatures reach 1900 F. A continuous feeder type incinerator equipped with dryer grates can eliminate this problem. Where the expense of such equipment cannot be borne, smoke formation can be reduced by reducing the thickness of the fuel bed and decreasing the supply of air through or on the fresh charge until radiant burning is well established. This presupposes a sensitive and automatically controlled air supply system.

¶ For a consistently high rate of combustion, an adequate supply of air through and over the fire is essential. Because of the heterogeneous composition of refuse, an air supply beneath the fuel bed must be capable of considerable volume adjustment. In general, the combustion rate may be increased with a gradual increase of underfire air until temperature causes fly ash slagging of the refractory lining. As that critical temperature of about 2100 F is approached, the air should be diverted gradually to overfire supply at high velocity. Properly aimed, this air maximizes combustion turbulence well above the fuel bed, and minimizes the formation of nitrogen oxides and carbon monoxide. Due to the high pressures necessary for both underfire and overfire air supply, a forced draft fan is required.

¶ The differences in grate resistance for the various available designs are substantial and should be critically evaluated in terms of added fan power costs versus performance advantages.

Optimum balance between underfire and overfire air requires constant variance of one or both air inflows. As a general rule, fuel which is excessively wet requires a large amount of air well-distributed from under the fire. Conversely, if excess oxygen is present close to the ignition surfaces, maximum quantities of nitrogen oxides will be formed. If underfire air supply is twice theoretical combustion air requirements, the fuel often will be under cooled, causing excess smoke. Theoretical air required to consume fixed carbon is only 20 percent of the total air input.

Overfire air should be modulated as necessary to oxidize volatile fuels and be available in sufficient quantity to cool combustion products to 2100 F by dilution, particularly when relatively dry fuel is employed. In order to obtain peak efficiency and minimize air pollution, provision should be made for automatically diverting overfire air supply to underfire supply as furnace gas temperature falls, and the volume of air supplied should be decreased. These operations should occur on an overlapping schedule, and should be adjustable to suit the nature of refuse being received. Automation of this phase is essential; it is truly impossible to make effective manual adjustments.



Fly-ash discharge would be released into the atmosphere if adequate collectors were not provided in the incinerator.

Adequate Drying

Successful consumption of refuse by burning is dependent upon preliminary exposure of the material to elevated temperatures long enough to reduce residual moisture to a minimum. Volatile gases, other than surface moisture film, are hydrocarbons and moisture chemically bonded to the solids – gases which are not driven off until surface ignition is accomplished.

Pre-drying is especially important when vegetable refuse is received, particularly leafy produce and melon refuse. Moving or progressive grate installations aid the processing of this material, but the rate of movement through the drying, gaseous burning, and solids burn-out grates; the depth of the drying and the burning beds; and the residual time on the various grate areas are subject to peculair characteristics of each type of refuse to be processed. Although various manufacturers recommend combustion rates per square foot of grate area as an index for selection of gross incinerator grate area, each separate grate section should be selected according to the normal service conditions to be encountered. Obviously, drying grate area cannot be selected properly on a basis of combustion rate; it must be selected relative to moisture evap-

oration, complex though that may be. To do otherwise is to further an empirical error of long standing.

Furnace Volume

Combustible gases will be evolved from the surface of refuse at an accelerated rate as it moves through the drying zone. Oxygen should be mixed with these gaseous emissions vigorously, to assure complete oxidation. Since this will take place in a very short interval, and since radiant energy is essential to combustion of smoke particles, it is impractical to separate combustions zones physically. Although this may seem heretical in view of the present practice of separating incinerators into ignition and combustion chambers, it is plain that the advantages of that separation are in pre-drying only, and combustion suffers from it.

Volume for mixing and burning commonly is designated as one cu ft for each 17,000 to 20,000 Btu per hr of energy release. This is unduly conservative, and it wastes space and material. A rate of 25,000 Btu per hr per cu ft is justified if the furnace design and air supply are consistent with the combustion process. Shape and dimensions of the combustion chamber are critical in terms of refractory erosion, slag deposition, and spalling. Ideally, overfire air supply and chamber geometry should be arranged to minimize impingement of turbulent gases upon refractory surfaces during combustion. Parallel refractory surfaces should be as widely spaced as possible to reduce radiant energy absorption in high combustion rate spaces, closely spaced where improved combustion rates are desired.

Adequate Area for Burnout

The size and motion of the hearth grate in the combustion area are governed by the quantity and nature of the refuse to be consumed. While oxidation of solids on the grate can be accelerated by an infusion of underfire air supply, this is only efficient up to the point where the supply of combustion air through parts of the grate short-circuits the fuel, cools the reaction, and slows the burning time. In short, complete burnout in the shortest possible time can be obtained only by controlling both fuel bed and air supply.

If complete destruction or burnout is desired, another hearth with independent air supply and process time controls must be provided. However, if small amounts of incompletely burned material can be tolerated, and adequately disposed of, there can be an economic saving in plant investment. Provision for accumulation and burnout of residue on an independent batch cycle promises economic and process advantages over any continuous discharge system.

Efficient Gaseous Exhaust

An efficient draft system will handle the furnace exhaust gases at a nonuniform rate without exerting variable pressures on the combustion air supply. This may be accomplished by controlling the suction (draft) pressure at the exit flue by a simple balanced draft damper, or by reducing gas flow by changing the capacity of the system. The latter methods may employ spray cooling of the gases to reduce stack effect, damper throttling, or induced draft fan speed control. For simplicity and reliability, the use of the induced draft fan and balanced air admission damper with overload limitation throttling dampers is recommended. Positive operation of the fan independent of furnace temperature will permit sustained and effective removal of the fly ash.

Air Pollution

One of the most effective arguments in favor of incineration is that it prevents the air pollution which would occur from burning refuse in open dumps. The object of an incinerator plant is to reduce emission of pollutants to an economically feasible minimum.

Hundreds of communities have adopted codes for control of air pollution. Usually these codes express maximum permissible emissible pollutant on a per unit of process operation. For an incineration plant, this might be expressed in pounds of fly ash per ton of combustible material, or per 1000 pounds of flue gases adjusted to the equivalent of 50 percent combustion efficiency. The latter takes into account the effect of dilution of the gases beyond a fixed amount.

While early codes were only effective to prevent gross maloperation of a combustion process, newer, more enforceable codes are stringent enough to force the use of special equipment which removes dust from the gases – to a degree that cannot be attained by simple settling chambers. It is anticipated that code requirements will become more strict as pollution knowledge is gained, and since incinerators are major sources of pollution, they will be subject to more severe restrictions, particularly when other pollution sources are brought under control.

Tests on settling chamber type incinerator units show that they exhaust some 150 grains of fly ash per pound of dry combustible consumed. Assuming a city of 100,000, and an average loading of 1.5 pounds of equivalent dry cellulose per day per person, the dust emission from incinerators without special flue gas cleaners will exceed 11 tons per week.

Fly ash is not the only air contaminant to be curbed. Olefin hydrocarbons, carbon monoxide, and nitrogen oxides are also primary pollution factors which cannot as yet be removed from flue gases economically. The Air Pollution Institute has contributed much to the knowledge of control of these factors, but the findings have not yet had widespread application.

Investigations of fly ash show a close similarity to Cottrell precipitate, long used in tests for rating dust collection devices. Consequently, this rating can be

utilized for selecting incinerator equipment when a correction is made for reduced inlet loading density. Lowered density is a result of air and water vapor dilution of flue gases, required to lower operating temperatures to meet safe thermal limits.

Fly ash has a high percentage (by weight) of particle sizes below 30 microns. It can be assumed that no form of gravity collection device will be effective, since an effective system will be required to capture particles as small as 3 microns in equivalent diameter. Gas washers and centrifugal collectors or a combination of both are the only devices that will cope with this problem effectively, and not increase the initial cost of the project substantially. However, a survey undertaken in 1958 revealed that no manufacturer of centrifugal equipment had significant experience in the incinerator market.

At that time, one application was found where a large municipal plant employed a centrifugal collector, preceded by water sprays. The system suffered from clinkering in the hoppers, fouling of surfaces with scale build-up, and corrosion by acid effluent water. Wet baffle systems investigated were found to be attacked by corrosive liquids, and pumps and piping were eroded by sharp siliceous ash. These difficulties seemed unreasonably punitive for the use of water for gas cooling and fly-ash precipitation. A reevaluation of the above factors led to a satisfactory design free from most of the problems.

Removal of a significant quantity of entrained particles requires the expenditure of more energy on the gas stream than is ordinarily available from a stack of reasonable height. This is true regardless of whether wetted moisture impingement baffles or centrifugal collectors are employed. The solution here is to employ a fan system.

First cost for any fan system is least where gases are handled at temperatures that do not require unusual fan construction or materials. Water is the best medium for reducing temperature, since its high heat of vaporization reduces the total weight of gases.

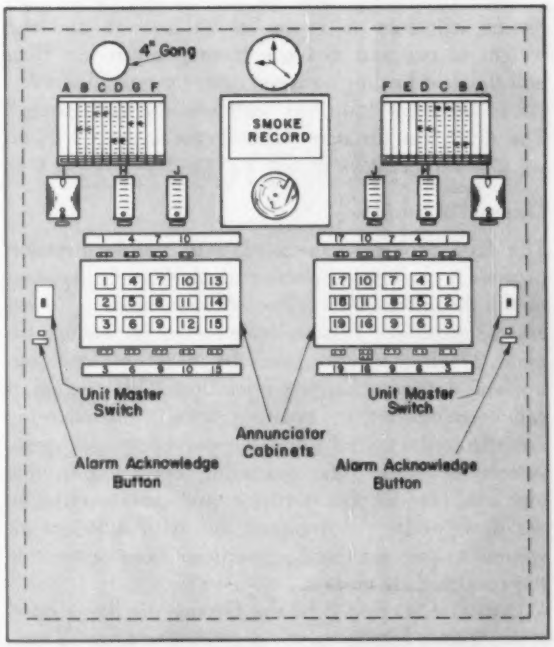
To prevent the formation of undesirable acid water effluent, a modulated, very fine spray system is employed to produce complete water evaporation, thus preventing gas saturation and possible downstream condensation. This would eliminate a major cause of corrosion and scale formation in the ash collection equipment. As a general rule, the probability of complete water evaporation is increased as the temperature control point is raised, gas turbulence increased, spray droplet size decreased, and spray path increased — all with due regard for direction, mass, and velocity of the initial and entrained droplet.

Operating costs of a centrifugal dust collector can be reduced by lowering the density of flue gases due to water vapor from spray control of the temperature. Power economies are gained from an increased natural draft obtained by maintaining the highest practical exit gas temperatures.

Water sprays, located at points of abrupt direction and velocity changes of flue gas flow, appear to promote an agglomeration of particles, so that many of the more abrasive particles are precipitated before the gases enter the main collection device. Use life of the equipment is thus prolonged, since a main disadvantage of the dry centrifuge system is erosion wear. Low inlet loading due to water vapor entrainment and curtailment of erosion wear of equipment are factors in favor of the use of centrifuge equipment.

A Typical Application

The Belmont, Massachusetts incinerator system, designed on this basis, required a two-year sustained effi-



1	Induced Draft Fan Operation	16	Stoking Floor Vent Fan
2	Charging Gate Position	17	Hydropneumatic Pumps
3	Load Signal	18	Hydropneum. Compressors
4	Forced Draft Fan Operation	19	Vacuum Cleaner Operation
5	Flue Gas Temperature		
6	Cone Fan Operation	A	Furnace Temperature
7	Stoker Motor Operation	B	Underfire Pressure
8	Control Water Pressure	C	Overfire Draft
9	Dust Conveyor	D	Draft Fan Suction
10	Smoke Density Signal	E	Hydropneumatic Pressure
11	Emergency Damper Position	F	Exit Gas Temperature
12	Ash Conveyor Overload	G	Entering Water Pressure
13	Spare	H	Minimum Burning Rate
14	Hydraulic System Pressure	I	Furnace Temperature
15	Hydraulic System Pumps	J	Cone Fan Volume Control

Instrumentation and control panel of a typical incinerator.

ciency guarantee for dust collection components. A thorough inspection of the dust collection units after the first 18 months of service revealed only a small accumulation of dry soft clinker at the entrance to the collector units, and slight evidence of corrosion or erosion. These collectors are all steel, multiple tube, short, venturi shaped inlet vane design.

Tests were made on this installation in accordance with ASME Power Test Codes 21 and 27 for an operating period of 120 minutes. This included 80 minutes at high burning rate plus the burndown and cleanout period of the batch operation. These tests revealed that dust concentration in the effluent gases averaged between 0.016 and 0.012 grains per cubic foot of exit gas. Calculation of the equivalent dust content of the flue gases, referred to 50 percent excess air, showed just under 0.13 pounds of dust escaped for each 1000 pounds of flue gases.

These results represent an over-all system dust arresting efficiency in excess of 90 percent, and the weight of material in the effluent gases is less than half the dust loading emission rates for typical municipal incinerators equipped with wet dust collectors.* The draft loss through the collector averaged 2½-in. wg at a temperature of 650 F.

Disposal of Residue

The final problem associated with the incineration process is reducing operational dust and disposing of the incombustible residue without creating an excessive nuisance. Dust is endemic to an incinerator plant. Much of it stems from the initial refuse dumping and furnace charging operation. This part of it can be minimized by isolating storage and charging areas from the rest of the plant; providing a pit spray system to blanket the unloading operation in fine mist and entrain dust particles; and cross ventilating the pit opposite the dumping line with sufficient air volume to prevent the dust particles from penerating the resulting air curtain.

Dust also is created by the furnace discharge operation. Two methods are in popular use to cope with the furnace discharge. One uses water spraying prior to and while discharging the material from the furnace ash hoppers, and the other uses a water bath with subsequent discharge by drag conveyor.

The first method is often initially more economical, but it has a number of disadvantages. The spray quenching of residue requires the wasteful use of large volumes of water to cool it below ignition temperature and to stop combustion of the small percentage of residual unburned material; and, unless the discharge is to a sealed container, there is considerable dust raised in spite of the water sprays. In addition, the operation is very dirty, and the cost of the building construction required to permit entrance of ash removal vehicles is substantially higher.

The second method, quenching and conveying, has the advantage of quenching the residue by suffocation, thus lowering water consumption and creating no effluent disposal problem. Unfortunately, since experience with the conveying problem has been so limited, overdesign of these systems is commonplace, and costs are high. Reasonable chain conveyor design criteria for minimizing over-all costs are as follows:

¶ Speeds should be low, and large sprockets should be used to minimize articulation.

¶ Wearing shoes and pads should be provided to prevent abrasive wear on flights and chains.

¶ Multispeed transmissions will permit lowest speeds of operation consistent with the residue loading.

¶ Overload clutches are used instead of shear pins.

¶ Pan liners should be provided on inclined runs to minimize cost of replacement when trough bottom plates are badly abraded.

¶ Copper bearing steel plate should be used to minimize atmospheric corrosion.

¶ All wearing parts should be alloy steel of maximum hardness throughout critical sections, consistent with replacement cost.

¶ Chain attachments should be located so that the chain is not subjected to accelerated erosion from grit trapping or precipitation.

¶ Return runs should clear the drag runs to avoid unnecessary chain wear and possible fouling at the furnace discharge chutes.

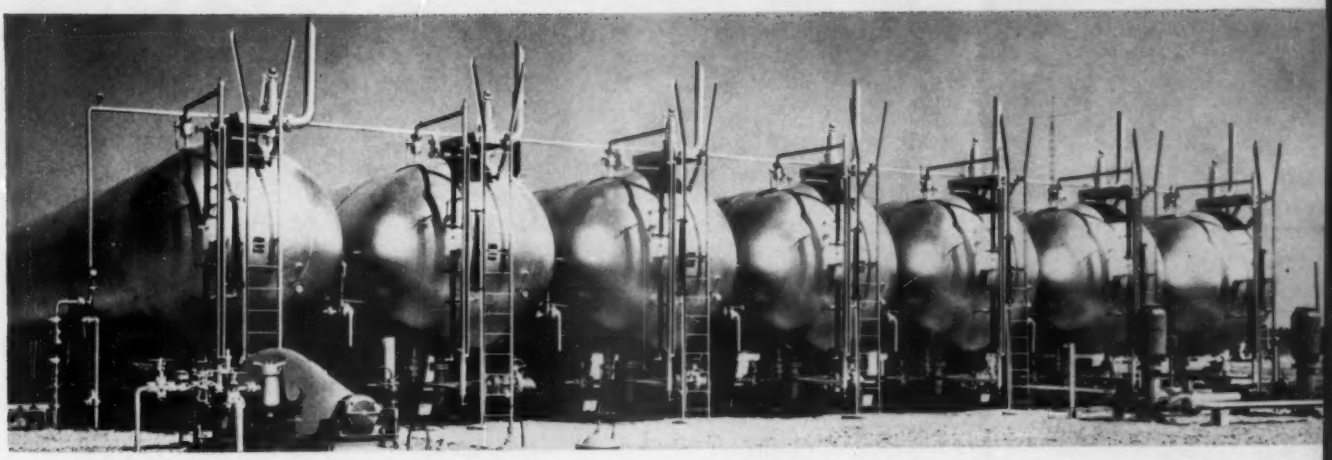
The amount of duplication desirable in a residue conveying system depends upon the cost of the system relative to the cost of the entire plant. Large plants can well afford complete duplication of facilities, but for smaller plants it is enough to provide duplicate drive machinery. The smallest plants should have only key components in inventory.

Incineration an Evolving Technique

The technique of disposing of refuse by incineration is still evolving. Many of the past design practices are either erroneous or require modification when viewed in the light of present knowledge of combustion and air pollution.

It should be especially clear that incineration plant design is similar to other municipal utility service plant design. Like a pumping station or a sewage treatment plant, an incinerating plant cannot be specified adequately by just calling for equipment to handle so much material per day – it must be matched to the community's needs and designed for operating compatibility with other municipal services. And finally, just as the simplest modern heating system cannot function properly without reliable automatic controls, neither can an incinerator plant. ▲▲

*Based on a tabulation in a report by Fred R. Rehm, Air Pollution Control Engineer, Milwaukee County, Wisconsin.



A battery of horizontal vessels, whose foundations have been designed and detailed by a digital electronic computer.

Computerizing Foundation Design

ELI CZERNIAK

THOMAS LAZEAR

The Fluor Corp., Ltd.

ELECTRONIC DATA PROCESSING provides many advantages for consulting engineering firms. The ability of the digital computer to carry out long sequences of arithmetic operations automatically at very high speeds makes possible both theoretical improvement and computational exactness. It now is practical to carry through complete mathematical techniques and the many cycles of rigorous solutions that may be necessary to approach more nearly optimum designs. By all means, we of the engineering profession must take fullest advantage of the new electronic tool at our disposal.

Generally speaking, computerization is best suited to problems that are repetitive both externally and internally; that is, they occur frequently, and each has a certain pattern of calculations that must be repeated several times to bring about a proper solution. Within this broad aspect the possibilities are almost limitless, ranging from comparatively simple and straightforward problems to extremely complex and challenging assignments.

The computer also affords us wide flexibility in our design approach. Some computer programs for solving intricate problems by rational analysis, rather than empirical methods, already have been written, and many more are now in the process of development. But while realizing our engineering Utopia, we must not lose sight of the dime a dozen routine problems that are our bread and butter.

This is particularly important in view of the rapid tempo, both technologically and economically, of our

modern society. Nowadays, the minute a contract is awarded, everyone is in a hurry to have the plant built and operable as soon as physically possible. For example, on many oil refinery and chemical plant projects, the guaranteed completion date already has shrunk engineering and construction time to nine months. Such accelerated schedules mean earlier field move-in dates, and the pressure mounts on the engineer to get out the drawings – especially foundation drawings, if the concrete is to be poured as scheduled. This is where the computer can contribute a helping hand on a routine problem. It enables us to issue complete and ready for construction foundation drawings the same day that pertinent information needed for design becomes available. Also, we do not have to sacrifice precision for the sake of schedule expediency.

Computerized Foundations

Actually, reinforced concrete equipment foundations, whether octagonally shaped as normally used for the typical skyward projecting slender vessels of the process industries or rectangular as commonly used for horizontal equipment, are ideal subjects for computers. Every foundation must be investigated individually for various loading combinations, and adequately proportioned to resist vertical as well as lateral loads.

In setting up our foundation programs, we placed heavy emphasis on simplicity of the required input data and clarity of the output. We felt that the engineer should not have to write down anything that the computer can deduce from other data while it performs all calculations necessary to design and detail the foundation unit. But, we also wanted the results to be complete and clearly presented.

Program for Horizontal Vessel Foundations

Our computer program for designing and detailing horizontal vessel foundations is a good example of our work in this field. The program is for use on Burrough's Datatron 205 – a general purpose, internally programmed, electronic digital computer with magnetic drum storage. Input is by optical reader, and output is by high speed punch. The paper tape is fed through the Flexowriter for the printed results. The Flexowriter operates independently of the computer, and new computations go on while the previous results are being automatically typewritten. Average computer time required is approximately 2½ minutes per foundation.

The element of repetition is present both externally and internally, and up to 14 loading combinations are considered in selecting the proper foundation. The program is sufficiently flexible for use on most jobs with no modifications, and is easily adaptable to code changes and other requirements that may become necessary in the future. Printout sheets provide all the necessary foundation dimensions, anchor bolt data, slide plate information when required, complete reinforcing bar bending schedule, and quantities of materials. They are sufficiently complete to be used as part of the construction drawings. In addition, a separate sheet for office use lists governing stresses and other pertinent design information. All results are in a form easily understood by field and office personnel, who need not be acquainted with computer terminology.

Design Considerations

Our practices for vessels which have two saddles resting on top of concrete piers can serve as a specific illustration. The steel saddles, as well as the number and diameter of anchor bolts, usually are part of the vessel design. The foundation proper consists of two reinforced concrete piers with spread footings. Common practice is to make both piers identical, except for the detail at the top.

Minimum pier thickness is made eight inches for ease in forming and pouring of the concrete. It also provides the necessary four inches minimum distance from the bolt center to the face of concrete. When a slide plate is required the minimum clearance around the saddle is two inches, otherwise, at least one inch clearance is provided between the edges of saddle and concrete. The spread footing is made at least six inches wider than the pier width, and the thickness is twelve inches minimum. In most instances it is preferable to increase the thickness of the spread footing rather than use top steel.

Fourteen loading combinations are considered:

1. Operating + Seismic (in transverse direction)
2. Empty + Seismic (in transverse direction)
3. Operating + Wind (in transverse direction)
4. Empty + Wind (in transverse direction)
5. Operating + Seismic (in longitudinal direction)
6. Empty + Seismic (in longitudinal direction)
7. Operating + Wind (in longitudinal direction)
8. Empty + Wind (in longitudinal direction)
9. Operating – Seismic (in longitudinal direction)
10. Empty – Seismic (in longitudinal direction)
11. Operating – Wind (in longitudinal direction)
12. Empty – Wind (in longitudinal direction)
13. Operating + Friction
14. Test (no lateral loads)

In conditions 5, 6, 7, and 8, the vertical component from balancing couple is added to the weight on one pier, and in conditions 9, 10, 11 and 12, the vertical component from balancing couple is subtracted from the weight on one pier.

The empty condition includes all permanent loads, such as the weight of the vessel and attached piping and insulation. The weight of the foundation includes both pier and spread footing, and the weight of earth

backfill on top of the concrete footing. The operating condition includes the weight of the liquid in the vessel during normal operation, in addition to all other loads used in the empty condition. The test condition is the total weight on the foundation during hydrostatic test. The computer searches for the maximum vertical load, and if "operating" is the largest, it is substituted for "test." Each pier is designed for half the total vertical load. Lateral loads, acting on the vessel in either direction, are assumed to be applied at mid-height of vessel, and also are divided equally between the two piers.

In the longitudinal direction, a vertical component of the balancing couple is added at the top of one pier and subtracted at the other. Lateral loads on the part of the pier above the ground also are included. It is common practice to increase the allowable stresses by one third for load combinations including wind or seismic. The same increase does not always apply to the maximum allowable soil bearing value. The sequence of calculations that are performed by the computer to obtain a complete solution is shown in Fig. 1.

Programming Considerations

Some true soul searching is always in order when formulating a computer program. One must anticipate the many areas where decisions might be required, and define explicitly, with no possible ambiguity, the specific conditions which will cause a certain decision to be made. After all, it always should be remembered that despite the mathematical prodigies digital computers perform, and their apparently great decisions, the sum total of their intellectual prowess is only the ability to differentiate between the bits zero and one. Hence, all necessary design techniques, any choice, selection, or decision making, no matter how small and apparently insignificant must be preprogrammed.

This is especially true when apparent decisions are not based on scientific methods, but are the result of experience-based judgment. For example, take the selection of required reinforcing steel. There are numerous combinations of bar diameters and spacing that could be generated to satisfy code requirements. Which, then, is the economically optimum combination? When is it more economical to increase concrete thickness rather than add more steel? Should you always try to achieve balanced design, where steel and concrete allowable stresses are reached simultaneously? When do you increase the bar spacing and when do you change the bar diameter? The answers to these and many other questions are also functions of some variable set of conditions. The engineer must set forth in the program all the standards on which the practical selection is to be predicated.

After the bar diameter and spacing are determined, the presentation of the results in the form of a com-

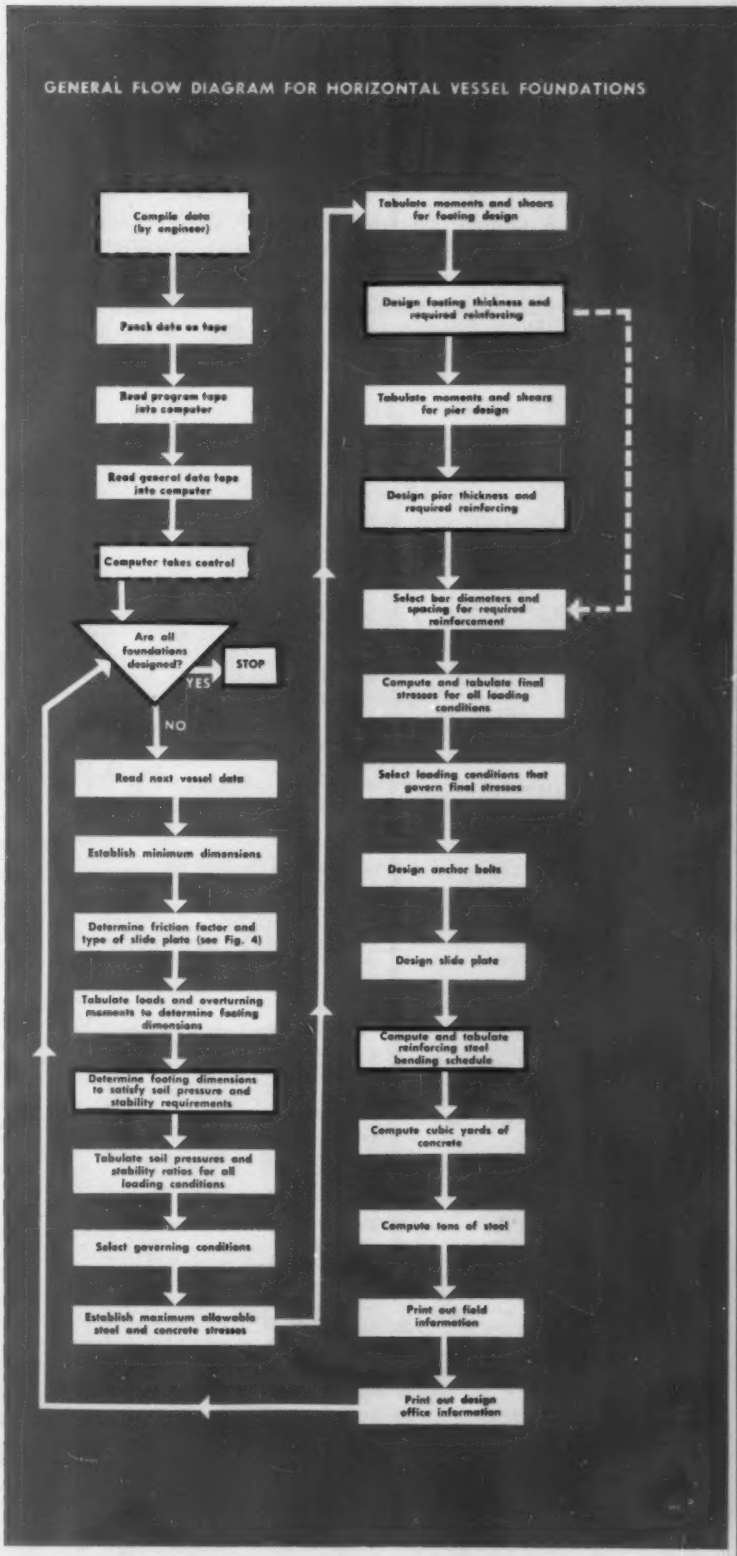

GENERAL FLOW DIAGRAM FOR HORIZONTAL VESSEL FOUNDATIONS
Compile data (by engineer)
Punch data on tape
Read program tape into computer
Read general data tape into computer
Computer takes control
Are all foundations designed?
YES
STOP
NO
Read next vessel data
Establish minimum dimensions
Determine friction factor and type of slide plate (see Fig. 4)
Tabulate loads and overturning moments to determine footing dimensions
Determine footing dimensions to satisfy soil pressure and stability requirements
Tabulate soil pressures and stability ratios for all loading conditions
Select governing conditions
Establish maximum allowable steel and concrete stresses
Tabulate moments and shears for footing design
Design footing thickness and required reinforcing
Tabulate moments and shears for pier design
Design pier thickness and required reinforcing
Select bar diameters and spacing for required reinforcement
Compute and tabulate final stresses for all loading conditions
Select loading conditions that govern final stresses
Design anchor bolts
Design slide plate
Compute and tabulate reinforcing steel bending schedule
Compute cubic yards of concrete
Compute tons of steel
Print out field information
Print out design office information

Fig. 1 — Computer sequence for the design of foundations.

plete bending schedule is a relatively straight-forward task. Setting up schedules of the detailing information required, in tabular or other form, is a simple matter of data processing for which electronic computers are, of course, ideally suited.

Data Input Sheet

A sample computer data input sheet, containing all data required for five vessels, is shown in Fig 2. It is simple enough for the engineer to fill out, without voluminous instructions, and yet has adequate provisions for the many variables that are peculiar to an individual job. The general portion of this input sheet should be self explanatory to any engineer acquainted with reinforced concrete design. Much of the general data has been internally programmed, and hence only those job requirements which do not conform to our standard practice need be written.

Regarding concrete stresses, space is provided only for f'_c — the minimum compression strength of concrete at age 28 days or at the earliest age at which it may be expected to receive its full load. Allowable stresses, as tabulated in the "Building Code Requirements for Reinforced Concrete" (ACI 318-56) are related to f'_c and were made part of the program. If flexural, shear, bond, and bearing stresses do not com-

SEND COMPUTER RESULTS TO: A. BLOOM
LOCATION: E5-62

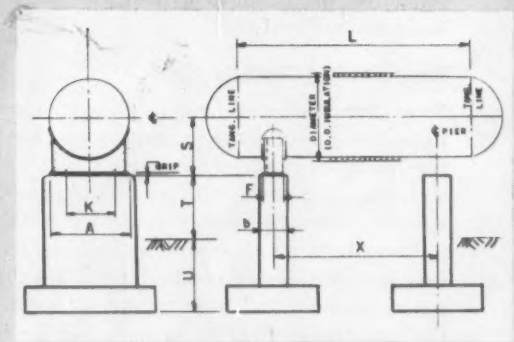
THE FLUOR CORPORATION, LTD.

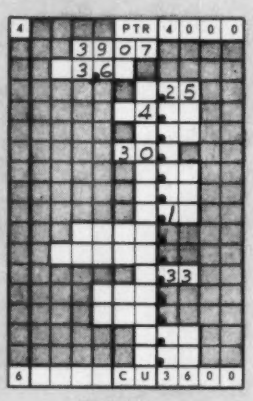
FOUNDATIONS FOR HORIZONTAL VESSELS
COMPUTER DATA INPUT SHEET

Fluor CONTRACT number _____
SOIL bearing (gross) _____ KSF
INCREASE in soil bearing (wind or seis.) _____
DEPTH of foundation (U) _____ FT.
STABILITY ratio [1.5] _____
WIND pressure (flat surfaces) _____ psf
Wind SHAPE factor [0.6] _____
Wind MULT. factor [1.2] _____
SEISMIC factor _____
CONCRETE, f'c [3,000] _____ psi
STEEL, fs [20,000] _____ psi
INCREASE in allowable stresses (wind or seis.) _____
Unit weight of soil [100] _____ pcf
Unit weight of concrete [150] _____ pcf
Maximum footing reinf. [1%] _____
Maximum pier reinf. [1%] _____

SPECIAL Requirements

1. Vessel NUMBER (letters in code) _____
2. Vessel WEIGHT – empty _____ kips
3. – operating _____ kips
4. – test _____ kips
5. Top of PIER to ℄ vessel (S) _____ FT.
6. HEIGHT pier above ground (T) _____ FT.
7. Vessel DIAMETER (O.D. Insul.) _____ IN.
8. Vessel LENGTH (L) _____ FT.
9. DISTANCE between piers (X) _____ FT.
10. Length of SADDLE (A) _____ FT.
11. Width of SADDLE, (F) _____ IN.
12. Number BOLTS per saddle [2] _____
13. Plate thickness, or GRIP (V) _____ IN.
14. Diameter of bolt HOLE _____ IN.
15. Length SLOTTED hole _____ IN.
16. Distance between bolts (K) _____ IN.
17. Shell TEMPERATURE [120] _____ °F
18. EXPANSION coeff. [.00667] per 100°F _____
19. Minimum pier WIDTH (b) _____ IN.
20. Lubrite or SLIDE plate auxiliary control _____





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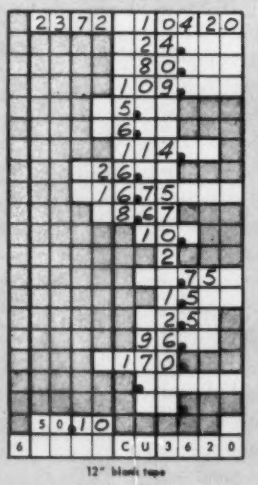

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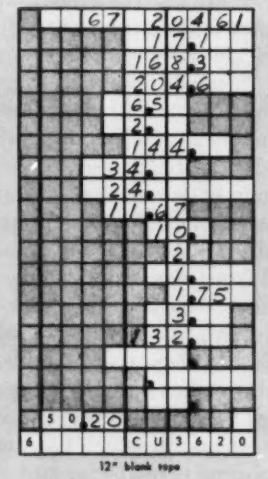

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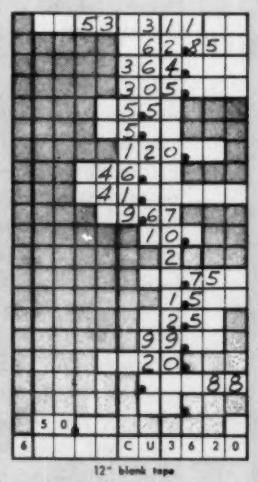

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ply with ACI requirements, they can be handled under the heading of "special" requirements.

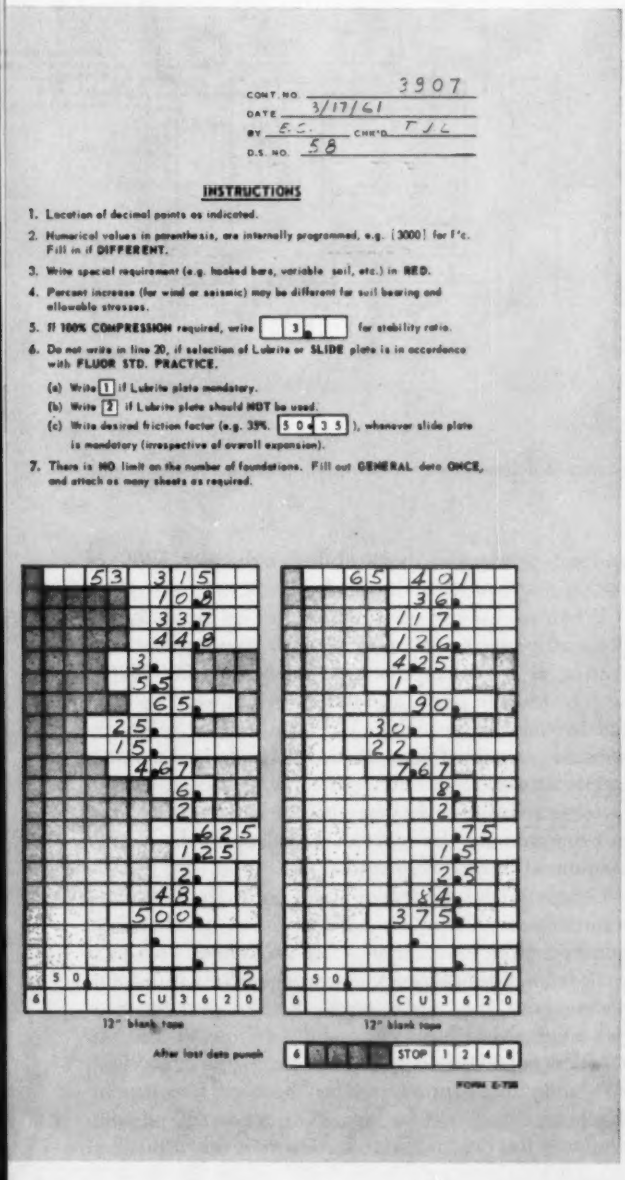
The last items of the general data enable the engineer to limit percent reinforcement, and thus have the means for exercising control, when he so desires, on the design of the foundations.

Special nonstandard requirements are handled through subroutines that are added to the program when their need is justified. Some of the subroutines we have added to date enable us to design foundations when soil bearing is given as a variable function of depth and width, when bars have to be hooked and there are special requirements for anchorage and amount of lapping, and when there are some special seismic considerations. Also, for some foreign jobs we change the computer output, so that bars are called out by diameters instead of our customary bar number designation.

The first item in the required individual vessel data is the equipment heading. Any letters present in the vessel identification number must be written in alphanumeric code, in which two numerals are substituted for each required letter. Space has been provided for two letters and four numerals, to be followed by an additional letter. The code for several letters, most commonly used with horizontal vessels, is as follows:

A = 20, B = 61, F = 65, H = 67, K = 72, T = 23, V = 53

Vessel weights and dimensions, plus saddle size, including bolt holes and lengths of slots required to accommodate thermal expansion, are indicated on the vessel drawings. The height above the ground usually


CONT. NO. 3907
DATE 3/17/61
BY E.C. CHK'D. F.J.L.
D.S. NO. 58

INSTRUCTIONS

1. Location of decimal points as indicated.
2. Numerical values in parenthesis, are internally programmed, e.g. (3000) for f'c. Fill in if DIFFERENT.
3. Write special requirement (e.g. hooked bars, variable soil, etc.) in RED.
4. Percent increase (for wind or seismic) may be different for soil bearing and allowable stresses.
5. If 100% COMPRESSION required, write [ ][3][ ] for stability ratio.
6. Do not write in line 20, if selection of Lubrite or SLIDE plate is in accordance with FLUOR STD. PRACTICE.
   (a) Write [1] if Lubrite plate mandatory.
   (b) Write [2] if Lubrite plate should NOT be used.
   (c) Write desired friction factor (e.g. 35% [3][5]), whenever slide plate is mandatory (irrespective of overall expansion).
7. There is NO limit on the number of foundations. Fill out GENERAL data ONCE, and attach as many sheets as required.

12" blank tape

12" blank tape

After last data punch

STOP

FORM E-736

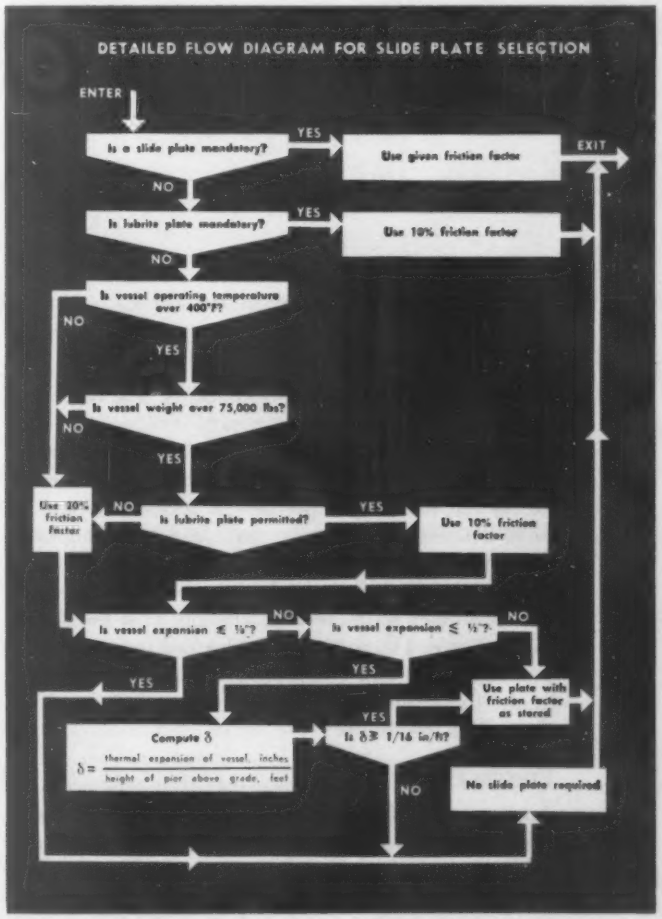


Fig. 2 – On the left, a typical computer data input sheet.
Fig. 3 – Above, computer sequence for slide plate selection.

DWG NO. 3907-1-1005A, REV. 1 — FLUOR CONT NO. 3907 — JOB No. TX- 104 A

DIMENSIONS:

X = 16'- 9"

B	D	d	b	d
4'- 2"	9'- 6"	1'- 2"	1'- 2"	9'- 0"
	X	h	a	c
	10'- 0"	8'-10"	1'- 6"	0'- 3"

ITEM 1. BOLTS: NO. 4 — DIA. 1 1/4" — LENGTH 1'- 0" — PROJ. 4" — X 4'- 0"

ITEM 2. SLIDE PL: 1 req'd

F	G	J	K	ø
1'- 0"	8'-10"	0'- 3"	8'- 0"	1 5/16"

ITEM 3. REINF. STEEL: .55 tons

REINFORCING BAR BENDING SCHEDULE

MK	TYPE	NO	SPACING	SIZE	a	b	d	cut length
01	L	38	9"	5	2'- 3"	2'- 3"		4'- 6"
02	A	38	9"	5				8'- 8"
03	U	40	12"	4	0'-11"	4'-11"		10'- 9"
04	A	10	12"	5				9'- 0"
05		NONE						

ITEM 4. CONCRETE: 10.29 cu yds

The FLUOR CORPORATION Ltd.

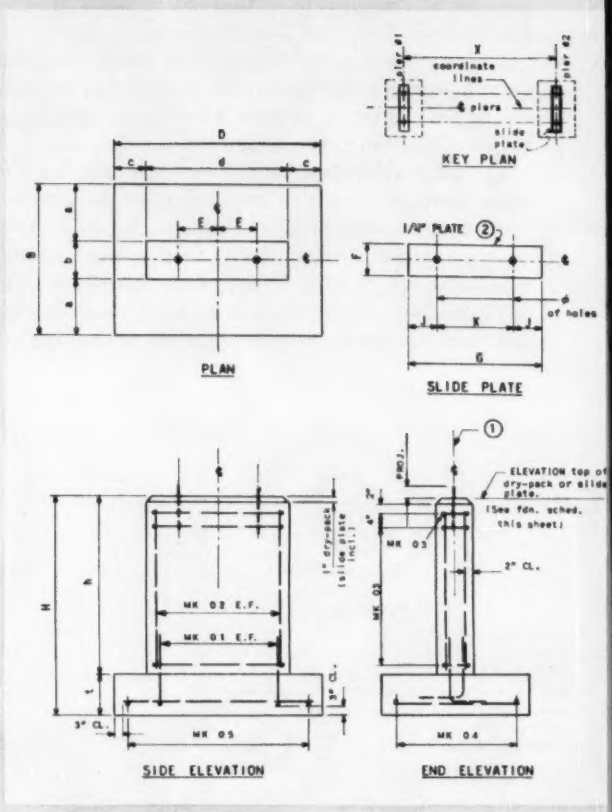


Fig. 4 – At left, the result sheet for field use. Fig. 5 – Center, standard drawing to which computer sheets are keyed.

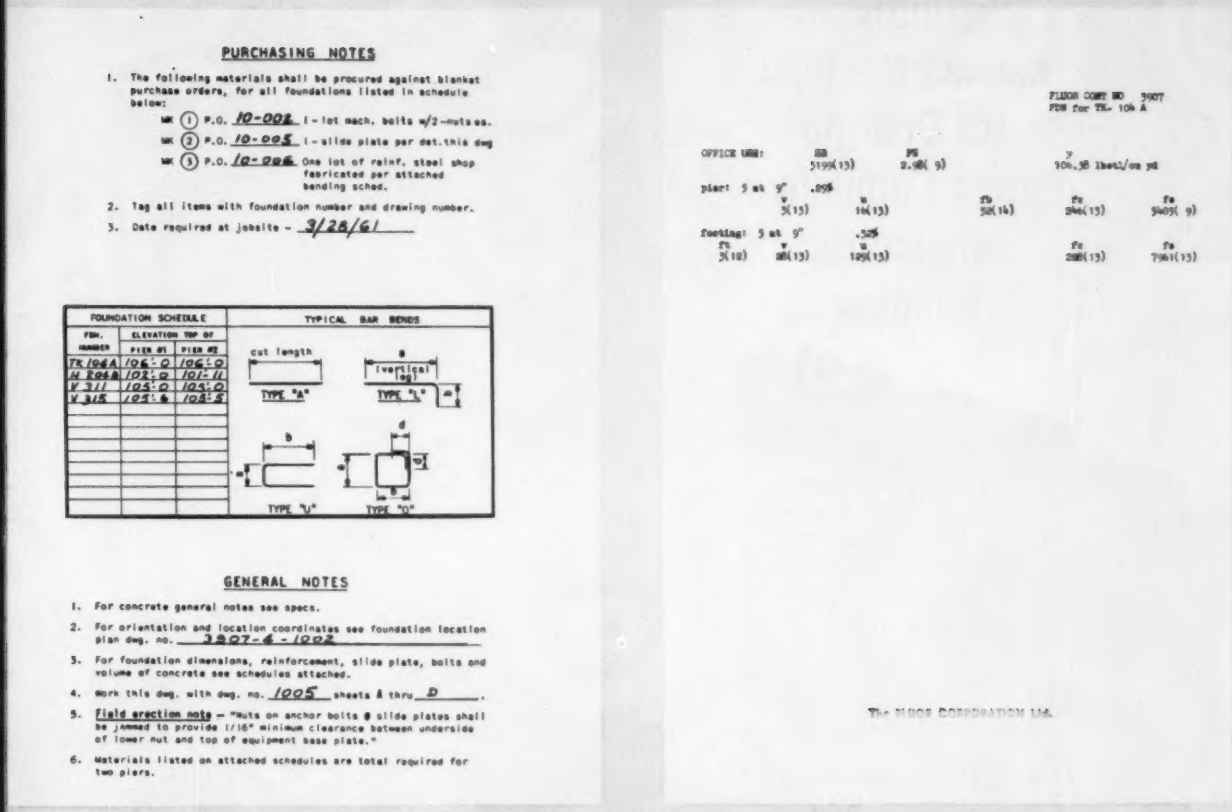
is determined by process requirements. The computer acts upon the given information to design and detail the foundation, as well as to check the adequacy of the bolts and slotted holes, even though these factors are in the realm of vessel design responsibility. The bolts detailed by the computer are determined from the given hole size, and whenever not adequate to transfer the shear force to the concrete pier, the engineer is notified in the results. The length of the slot in the sliding end support also is checked for given temperature expansion. When the given length is not adequate, the computer prints out the needed length at the end of the results.

Friction Factors

An important consideration in the design of foundations for horizontal vessels is the frictional forces developed during the increase in vessel temperature. Where the total expansion is small, and vessel supports are relatively high, part of the force will be dissipated in the pier deflection and the rotation of the footing. To what degree this happens is a matter of conjecture and is dependent on the flexibility of the pier, width of the footing, and yieldability of the soil.

When we use a steel sliding plate, we normally apply a 20 percent friction factor. For heavy vessels operating at high temperatures, self-lubricating plates, such as Lubrite plates and other devices which reduce the friction are available. With Lubrite or other expansion plates that have special graphite and metallic inserts for self lubrication, the commonly used friction factor is reduced to 10 percent. The logic pattern used in programming the criteria for selecting the sliding medium is shown schematically in Fig. 3.

Computerized design promotes conformity and standardization; there is no mistake about that. The question often asked is whether an animal such as a well defined design practice ever existed. If it did not, it does now. It is what comes off the computer after the program has been successfully debugged. But not all doors need be slammed on all independent thought. We made ample provisions for the alert free lancing engineer, who thinks for himself, to retain full jurisdiction over the design variables. He may, when justified



PURCHASING NOTES

1. The following materials shall be procured against blanket purchase orders, for all foundations listed in schedule below;
   - wk (1) P.O. 10-002 1 - lot mach. bolts w/2-nuts ea.
   - wk (2) P.O. 10-005 1 - slide plate per det. this dwg
   - wk (3) P.O. 10-006 One lot of reinf. steel shop fabricated per attached bending sched.
2. Tag all items with foundation number and drawing number.
3. Date required at jobsite - 3/28/61

FOUNDATION SCHEDULE		
FDN. NUMBER	ELEVATION TOP OF PIER #1	PIER #2
TK 104 A	106'-0	106'-0
H 204 B	102'-0	101'-11
V 311	105'-0	105'-0
V 315	105'-6	105'-5

TYPICAL BAR BENDS

cut length — TYPE "A"

a (vertical leg) — TYPE "L"

b — TYPE "U"

d — TYPE "O"

GENERAL NOTES

1. For concrete general notes see specs.
2. For orientation and location coordinates see foundation location plan dwg. no. 3907-6-1002
3. For foundation dimensions, reinforcement, slide plate, bolts and volume of concrete see schedules attached.
4. Work this dwg. with dwg. no. 1005 sheets A thru D.
5. Field erection note - "Nuts on anchor bolts @ slide plates shall be jammed to provide 1/16" minimum clearance between underside of lower nut and top of equipment base plate."
6. Materials listed on attached schedules are total required for two piers.

FLUOR CONT NO 3907
FDN for TK- 104 A

	SB	FS	y
OFFICE USE:	5199(13)	2.98(9)	104.38 lbswt/cu yd

pier: 5 at 9"	.895					
	v	u	fb	fc	fs	
	5(15)	144(13)	50(14)	246(13)	5409(9)	
footing: 5 at 9"	.525					
ft	v	u		fc	fs	
5(12)	28(13)	129(13)		288(13)	7961(13)	

THE FLUOR CORPORATION LTD.

Fig. 6 — At right, the computer result sheet for office use, which gives the data needed for the engineering and estimating.

by special circumstances, exercise control on any or all elements of design, from the weight of the soil to the selection of a slide plate.

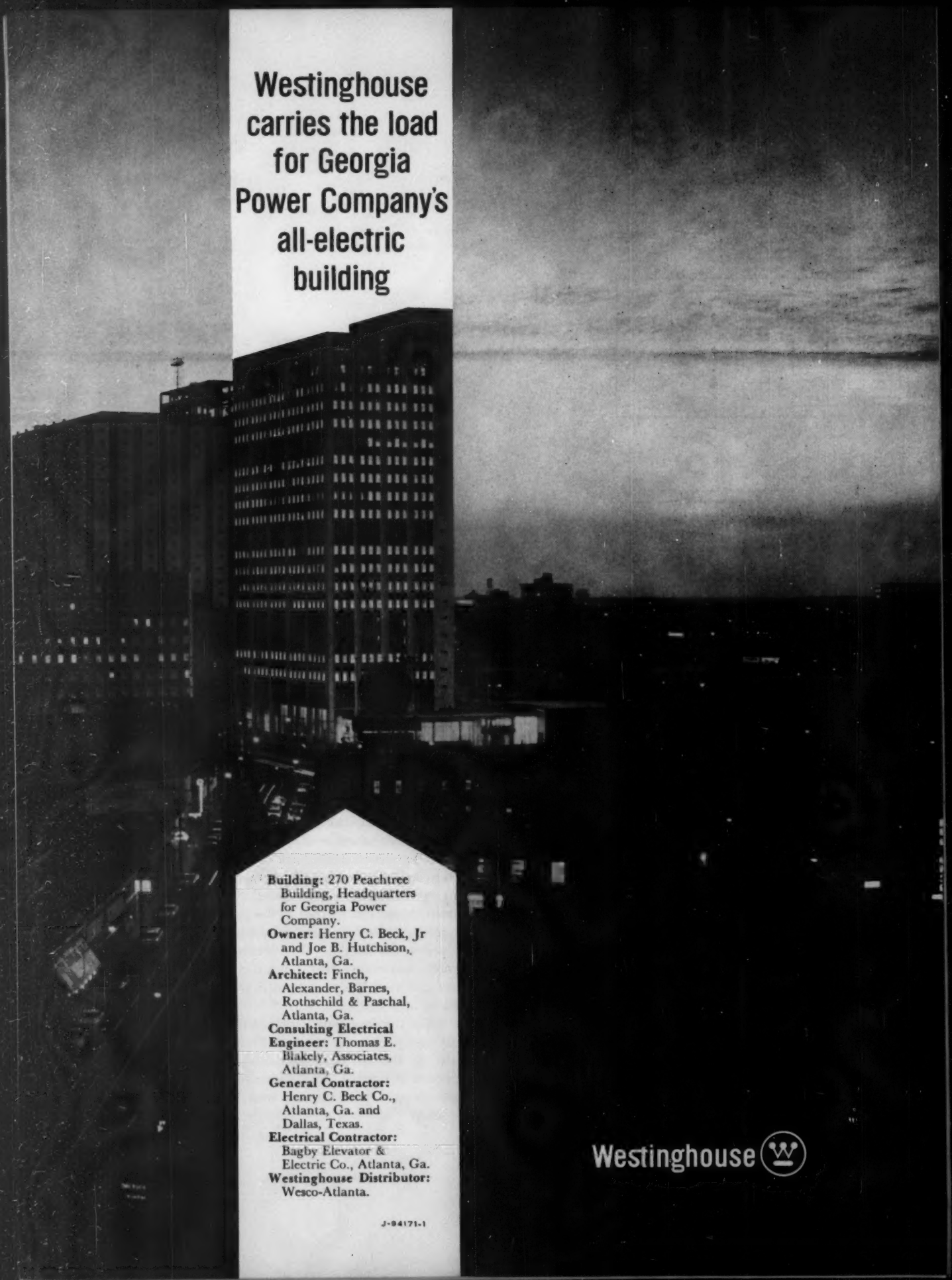
Computer Results

The end product of the computer is an area where simplicity and clarity are even more important than on the input side. We hardly could overemphasize the advantages of having computer results in a form that can be used directly for construction drawings.

Computer results are printed out on two separate 8½" x 11" sheets, one for field use and another one for the office. The first sheet (Fig. 4) has space at the top for the engineer to write-in, by hand, the drawing number. It provides all pertinent information needed for construction, such as concrete forming dimensions, bolt list, slide plate details when required, tonnage of reinforcing steel, complete bar bending schedule, and required volume of concrete. All dimensions are keyed to a standard drawing (Fig. 5) of details for horizontal vessel foundations, which is issued together with the computer output sheet.

The second sheet (Fig. 6) contains information for engineering and estimating purposes. The first line shows the maximum soil bearing (SB), minimum factor of safety against overturning (FS), and the weight of steel used per cubic yard of concrete (y). Next are shown the size and spacing of vertical reinforcing, as well as the percentage of steel in the pier, to be followed by the maximum stresses. The numbers in parentheses, next to the governing stresses, indicate the loading combination which caused the stress to become maximum. The stresses in the pier are tabulated in the following order: shear (v), bond (u), bearing stress under the saddle (fb), concrete compression (fc) and maximum steel tension (fs). Combined bending and axial loads are used in determining maximum pier stresses.

The following line shows footing reinforcing: size, spacing, and percentage of steel. Footing stresses are tabulated in the last line. Maximum tension (ft) in the concrete is printed first, followed by shear, bond, concrete flexural compression, and maximum steel tensile stress. ▲▲



Westinghouse carries the load for Georgia Power Company's all-electric building

Building: 270 Peachtree Building, Headquarters for Georgia Power Company.
Owner: Henry C. Beck, Jr and Joe B. Hutchison, Atlanta, Ga.
Architect: Finch, Alexander, Barnes, Rothschild & Paschal, Atlanta, Ga.
Consulting Electrical Engineer: Thomas E. Blakely, Associates, Atlanta, Ga.
General Contractor: Henry C. Beck Co., Atlanta, Ga. and Dallas, Texas.
Electrical Contractor: Bagby Elevator & Electric Co., Atlanta, Ga.
Westinghouse Distributor: Wesco-Atlanta.

J-94171-1

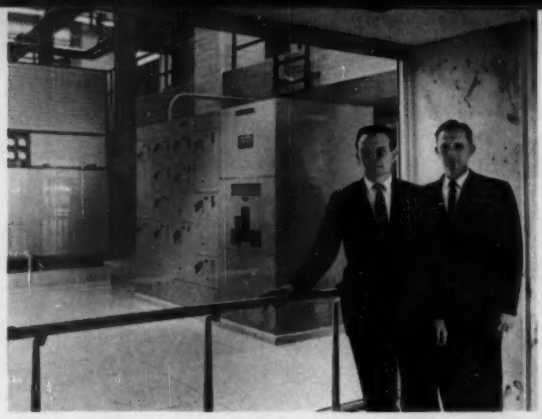
Westinghouse

Georgia Power Building

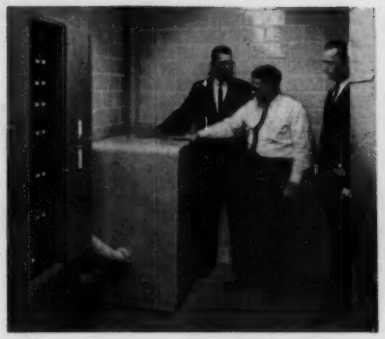
Atlanta

Designed with an all-electric concept, the 22-story **270 Peachtree Building**—Atlanta's newest skyscraper—serves as headquarters for the Georgia Power Company. Some of the electrical statistics:

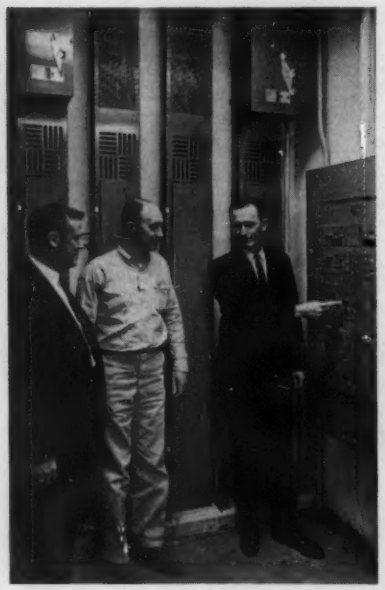
Service voltage—266/460
Service entrances—Two 4,000 ampere bus duct runs
Main breakers—Two 4,000 ampere, parallel
Connected load—8,000 kilowatts
Estimated demand—4,035 kilowatts
Air conditioning—1,000 tons (two 500-ton units)
Ninety kilowatts of lighting per floor
Eighty-seven kilowatts resistance heating per floor
Total electric load—23 watts per square foot in office areas



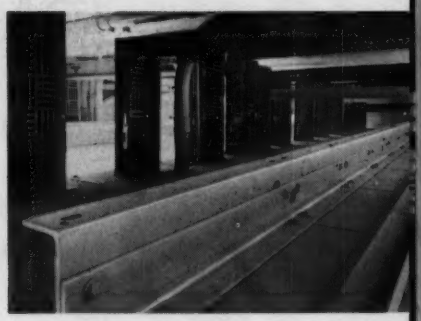
C. A. Alexander, Architect, and Earl Blakely, Consulting Engineer, shown in the handsome lobby of the Georgia Power Headquarters office building. Lobby was designed to showcase mechanical and electrical equipment and stress the importance of electrical services in modern office building operation. Westinghouse motor control center at right groups combination starting units into one structure affording flexibility, accessibility and safety. Modular construction features tilt-out design to isolate starters from bus for extreme safety in maintenance and inspection. This motor control center controls and protects mechanical room pump and fan motors.



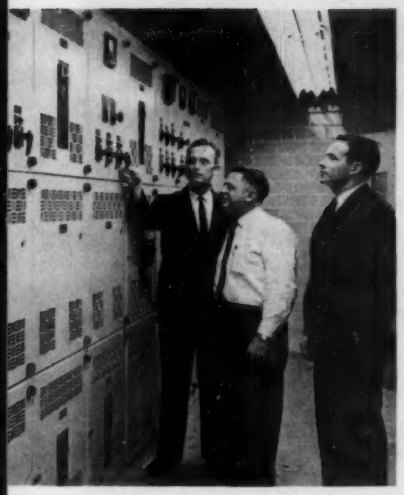
Discussing the low case temperature of a 300 KVA type DT-3 dry-type transformer are J. W. Tysinger, Westinghouse Sales Engineer; T. E. Luther, Building Superintendent and Earl Blakely. Silicone insulation in this class H (150°C) transformer offers greater resistance to heat . . . provides a greater range of safety for overloads . . . thus prolongs transformer life. This transformer steps 480 volts down to 120/208 wye for distribution. Westinghouse convertible type CDP panelboard at left contains De-ion® circuit breakers for positive protection against short circuits and over-loads.



J. E. Chambers; O. U. Moore, Jr., Contractor Job Superintendent; and Earl Blakely, discussing a Westinghouse motor starter panel. Two such panels are located on each of the building's 22 floors to control supplementary perimeter heaters. New motor starter panels afford grouping when a small number of circuits are to be controlled. Low-impedance bus duct runs at rear feed electric heating. Bolt on power take-off devices limit high fault currents available in the system, protecting all electrical devices.



Top view of low-voltage switchgear shows two runs of 4,000-ampere low-impedance bus duct handling incoming power and nine 800- to 1600-ampere feeder runs. Six of these runs serve as vertical rise feeders that carry full power to all building loads. Bus duct was specified for its flexibility for future load growth additions . . . also, bus duct has a lower installed cost than cable or conduit. A high degree of coordination was necessary on this job to insure equipment match-up. Westinghouse provided this coordination in a complete line of quality equipment.



Earl Blakely, T. E. Luther and J. R. Miller, Westinghouse Construction Engineer, discuss metering on main assembly of metal-enclosed low-voltage draw-out switchgear. Incoming power is fed into two main DB 100 air circuit breakers. Electrically operated DB-50 breakers serve as feeders and another is used as a tie breaker so that entire board may remain energized during emergency. Current limiting fuses are mounted in series with all breakers to protect against high fault currents available. Westinghouse DB breakers were specified, since so much of the building load is fed from each breaker that dependable service from a heavy-duty breaker is an absolute requirement.

J. E. Chambers, Vice President, Bagby Elevator & Electric Co., and H. H. Cook, WESCO, inspect a Westinghouse Life-Line combination starter. A convenient start-stop button is mounted in the cover of this size 1 Class 11-206 combination starter designed for across-the-line voltage starting. A type AB-I 100 ampere circuit breaker is mounted at right. This breaker utilizes the De-ion principle of arc extinction which stretches and extinguishes an arc faster, with less contact temperature rise than any known system.

J. J. McDonough, President, Georgia Power Company and A. H. Wade, Jr., Manager, General Services Department, entering one of six high-speed Westinghouse Selectomatic® elevators located in the building. Comfortable cars are finished in white decorator Micarta® and are equipped with intercom and music. They serve this 22-floor building quickly and efficiently at 800 feet per minute.

Lobby floor office area of Merrill, Lynch, Pierce, Fenner and Smith, comfortably illuminated by 2′ x 4′ Westinghouse Mainliner fluorescent fixtures. Mainliners are available in a variety of sizes and mounting arrangements with a full line of shielding media for complete flexibility. In this installation Owens Corning Polarizing Panel shielding was utilized to eliminate glare on the automatic stock board.

Specify Westinghouse for completeness of product line . . . for complete service—before, during and after construction . . . for complete dependability. *You can be sure . . . if it's Westinghouse.*

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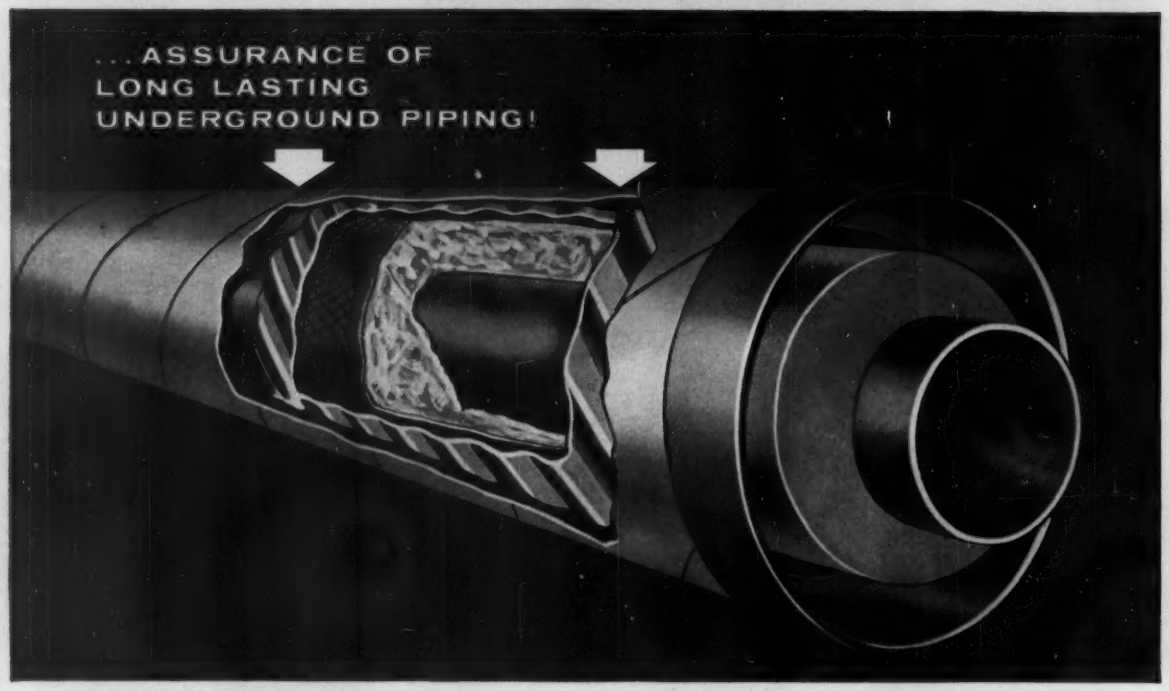

Hot-dip galvanizing of the Hel-cor Conduit in a Ric-wiL system offers the finest in corrosion protection. The Zinc actually alloys to the steel and becomes an integral part of the conduit . . . not just a surface coating. The Automobile Industry has announced through The American Zinc Institute that after testing 450 coatings, Zinc was best from the standpoint of resistance to corrosion.

The illustrated catalog offers a wealth of information on types' of systems, engineering, specifications, and installation methods . . . write today for your copy. . .

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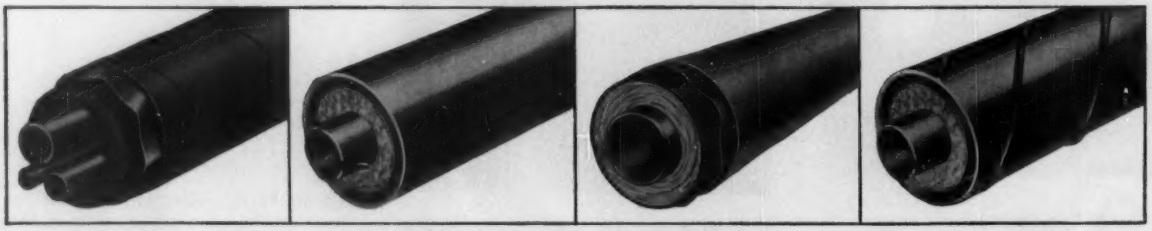

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Canadian Consultants' Vancouver Meeting

STAFF REPORT

THOUGH SOME members of the Association of Consulting Engineers of Canada are inclined to think that their organization is a bit on the "stuffy side," this is not readily apparent to the casual observer. Of course, any group which faithfully attends the professional and technical sessions of an engineering society gathering when the weather is a sunny 72 F in mountain ringed Vancouver is wide open for such a charge. At any rate, the Association of Consulting Engineers of Canada managed to get some 40 or more engineers together at the Vancouver Hotel for their annual meeting on June 1. Under the chairmanship of John H. Ross, the Association's new president from Toronto, the meeting proceeded with dispatch – except for a couple of important matters which led to wide open discussion.

One of the important achievements of the Canadian Association last year was the approval of a set of bylaws to govern chapter activities. At this point the Prairie Provinces have a very active chapter; the Ontario Chapter is being rejuvenated and becoming quite active; the Quebec Chapter, which is in the process of organizing itself, will soon achieve active status; and it is anticipated that a British Columbia Chapter will soon be in operation. As always, however, when chapters are established, the question of local autonomy arises. Thus, it was not surprising that Norman Lawrence, of Edmonton, presented a new approach to membership approval which would avoid polling the 120-odd present members of the ACEC. His committee suggested that the various chapters approve new members and that members thus approved have their application published in the newsletter of the Association for two succeeding editions. It was quickly pointed out by members from the floor that this concept was in direct opposition to the bylaws and, although it appeared that a method could be worked out to avoid this technicality, the group voted to retain its original membership application procedure.

In addition to his report as past president, R. R. Duquette, of Montreal, also reported on his experiences at the FIDIC meeting, in Zurich. Duquette, who is himself bilingual, was lavish in his praise of H. Rusting, FIDIC secretary, who is trilingual. He also had high praise for the extremely competent organization work of the Swiss hosts, whose association has only a little more than 40 members. Although Duquette did not give a detailed report of the business sessions, he did convey the enthusiasm of the representatives from 15 countries who compiled a 100 percent attendance record. (For a complete report on the Zurich meeting of FIDIC, see page 56.)

Among the other problems discussed at the Canadian meeting was the question of a brochure to promote the private practise of engineering. It is evident that the Canadians are less aggressive about public relations than their United States counterparts below the border. It finally was decided that the money which would be spent on a brochure might better

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find its way into the production of a much needed, and long planned, manual of practice.

Another problem bothering the Canadian group was the infiltration of quantity surveyors from Britain. One such firm is selling its services to municipalities for a fee of around 2 percent of the construction cost with the claim that it can save its charges by enabling the client to get a better bid and insure that he will get what he is expecting from the contractor. Unfortunately, the engineers complained that the quantity surveyors invade their offices while the project is still in the design stage, reducing the efficiency of the design staff and actually hindering the development of the project design.

It is interesting to note that the Canadian problems are little or no different from those encountered in the United States. In fact, the Consulting Engineers Council and the Association of Consulting Engineers of Canada could easily exchange agendas without great loss to either. The only difference between them is the time involved. The Canadians polished off their agenda in one afternoon – probably not time enough. CEC, on the other hand, takes well over two days for its agenda and is forced to forget about some of the items.

But there is one important area where the Canadians differ from their counterparts down South. They are much interested in engineering abroad and are quite familiar with the activities of the World Bank and other such organizations. In fact, they have already participated in the Canadian Trade Fairs in Ghana and Nigeria and probably will do so again. Though Canadians have shed much of their British-French heritage, they are still very much aware of the world around them. They are no longer exporting colonials, but they are certainly making a determined effort to export engineering talent. ▲▲

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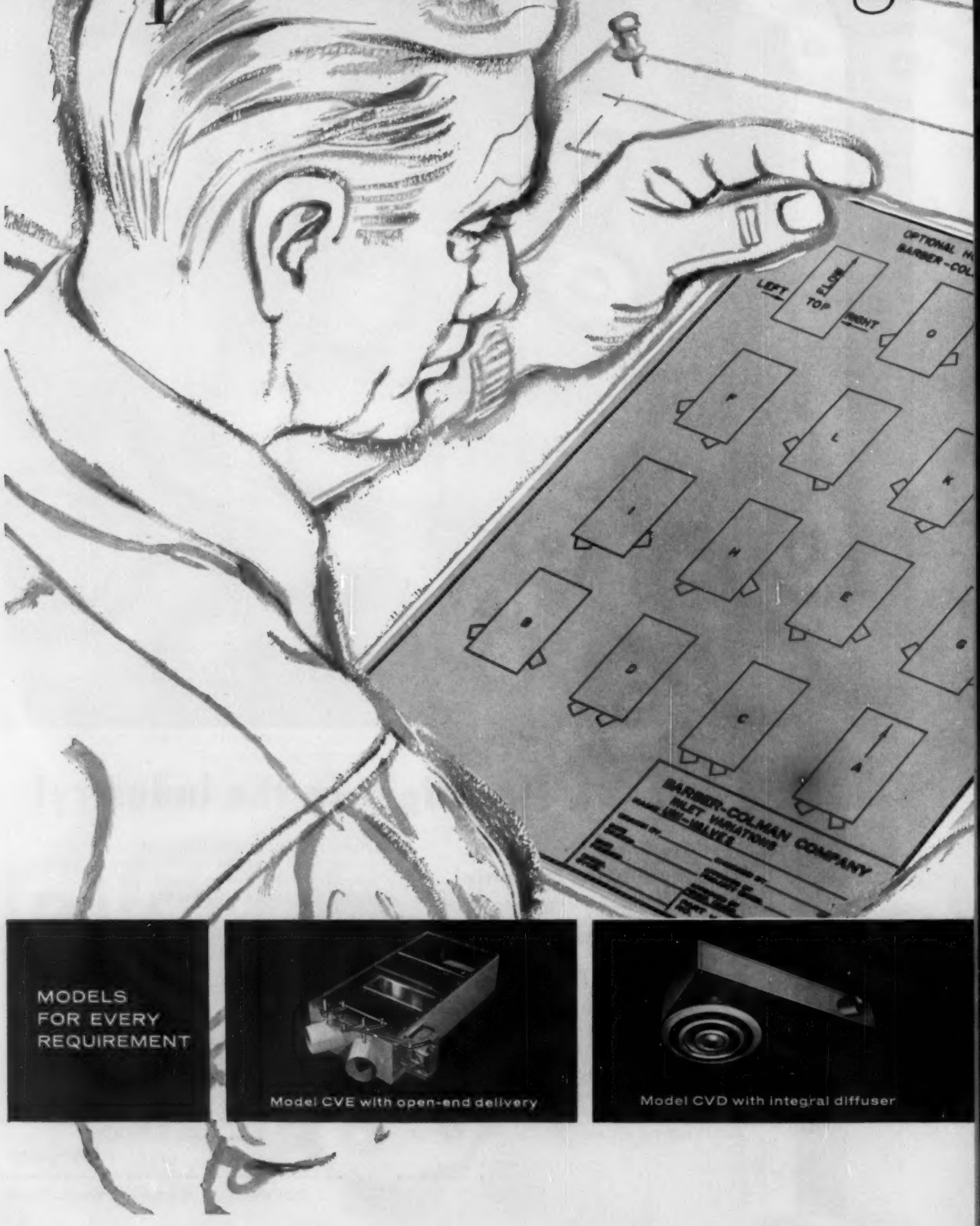

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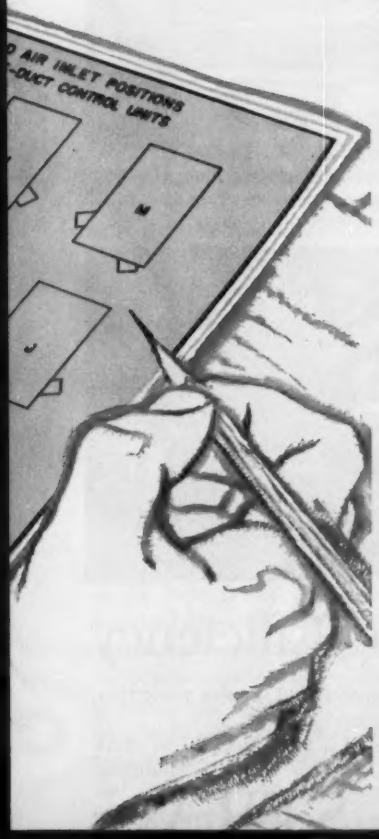
Double-duct control units with new Uni-Valve design provide tight shutoff . . . extreme simplicity . . . and lower sound levels



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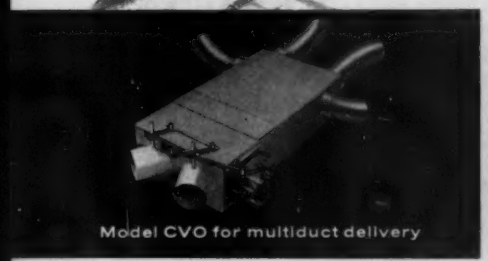
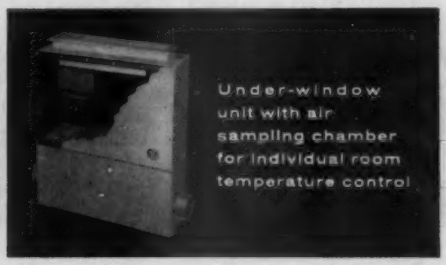
For complete information, call your local Barber-Colman Air Distribution Products Field Office, or write direct to the factory for literature.


Model CVO for multiduct delivery


Under-window unit with air sampling chamber for individual room temperature control

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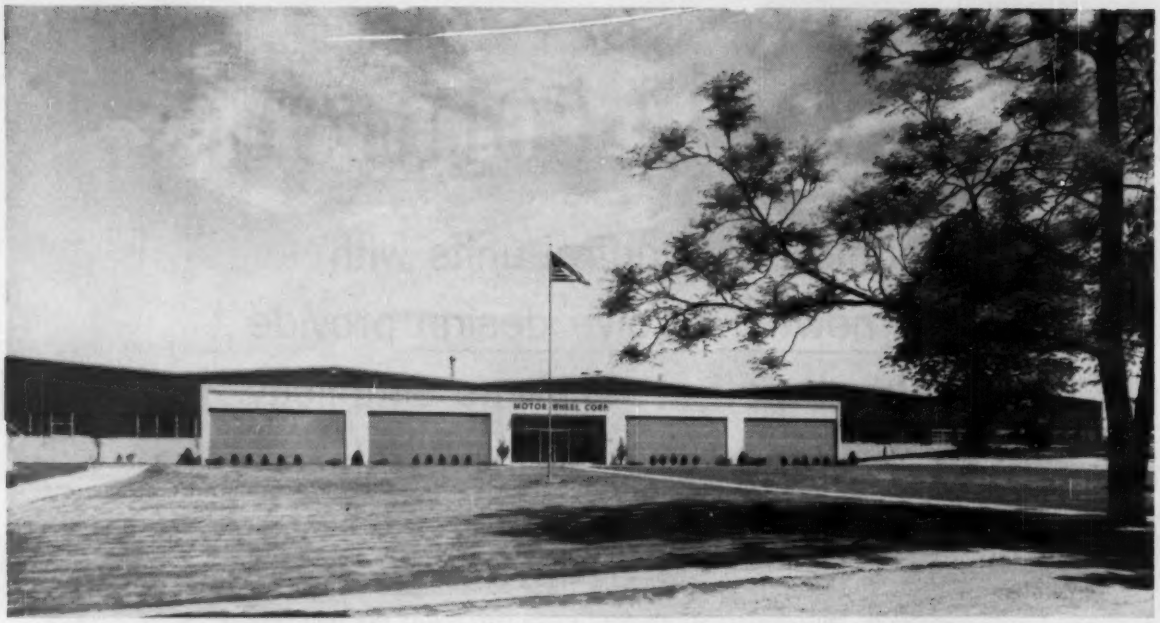
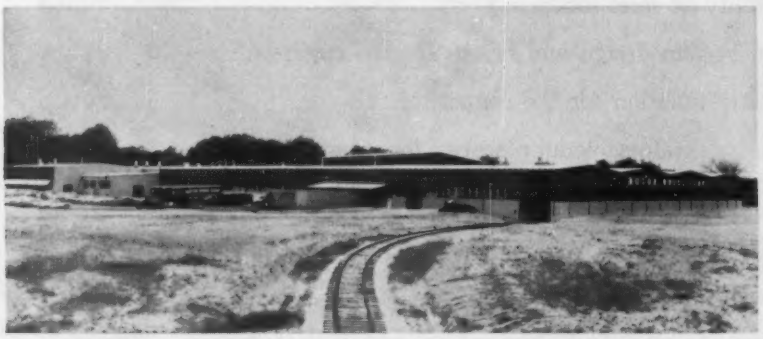


The 121,000-sq.-ft. Motor Wheel Corporation building at LaGrange, Indiana, is a well designed production tool and a real asset to the community. In addition to colorful, low-profile beauty, such features as overhead offices and storage to save floor space, plenty of room for overhead equipment attached directly to the steel framing, and custom-designed facilities for shipping and receiving were specially incorporated to meet Motor Wheel's particular needs.



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MARJORIE ODEN
Eastern Editor

The Planners in Jersey

Field Notes

NEW JERSEY ENGINEERS, already unhappy at having their state chosen for an architects' test case to determine the line between architecture and engineering (the McCamy Case), now have another professional headache — planning bills. For the past three years, bills aimed at the registration of planners have been proposed. This year two bills, involving both registration and licensing of planners, have been introduced. Although the legislature will have these bills on the agenda when they meet late this year, no action is expected.

"Past history indicates the planners will be back next year with more legislation along the same lines," Richard Silver, chairman of the New Jersey Society of Professional Engineers legislative committee, explained NJSPE members are convinced that they — as a state group — are fighting the planners on a national level. Thus, they intend to ask for "moral, not financial" support from NSPE — and fully expect to get it.

The Basic Controversy

At this point, planners are not registered or licensed in any state, although legislation along these lines has been introduced and defeated in New York, Pennsylvania, and Michigan. "We hear the American Institute of Planners thinks if prototype legislation is passed in New Jersey, it can get similar legislation passed in all the other states," one engineer explained.

The American Institute of Planners does not admit backing the New Jersey group, but evidence indicates they at least have a strong interest in what is going on. Three years ago, the New Jersey planners first proposed they be registered, with no mention of licensing. The engineers objected. Because some municipalities complained they did not have sufficient protection against unscrupulous planners, the engineers met with the planners this year and agreed on a registration and licensing bill for joint sponsorship.

Before the engineers could introduce this compromise bill, the planners put in a "surprise" bill of their own. The engineers reacted violently, and it looks like at least a temporary stalemate.

In the engineers' bill, the five-man board of registration for engineers and land surveyors also would issue licenses for planners. The board (four engineers and one land surveyor) would remain the same for all matters pertaining to engineering and land surveying. On planning matters, two planners would sit with the board.

The planners' bill would create a new five-man board composed solely of professional planners, appointed by the governor from a list of suggestions presented by the New Jersey Chapter of the AIP.

The engineers' objection to this is that if there is a possibility of fu-

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New Type M Precipitator

...a study in simplicity

by
D. Miller,
Technical Manager,
Permutit

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We call it the Permutit Type M Precipitator. It is a study in simplicity, and because of its low construction and operating costs, it opens up new opportunities to obtain solids-contact clarification at minimum cost.

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Briefly, this is how the "M" unit works: raw water and chemicals are mixed in line and enter at the center of the tank floor beneath the conical rotor float which deflects the fluid mixture radially outward to the walls. A horizontal baffle on the tank wall then reverses the flow back toward the center thus imparting a rolling action to the sludge blanket. This current flow constantly places previously formed sludge in intimate mixture with the raw water immediately as it enters the tank. Clarified, effluent is collected by a flume at the top.

Sudden water changes: An additional benefit of the Permutit type M Precipitator is its exceptional ability to handle shock loads.

A case in point: red dye from a paper mill a mile upstream showed up one day in the raw water entering a Permutit type M Precipitator in use in New England. But the unit went right on putting out an effluent with no significant change in quality.

So much interest has been shown in this new unit that we have reprinted the paper, "A Recent Development in Solids Contact Clarification Design," by E. D. Driscoll of Permutit. We'll be glad to send you a copy.

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ture hairline distinctions among engineering, surveying, and planning, they should all be administered by the same board to avoid problems similar to those of the architects and engineers. Engineers expect further difficulties, because planners are allowed to advertise and to bid for jobs.

The Planners' Plans

Of course, many New Jersey engineers object to the whole idea of planners being licensed and registered as professionals.

"Take the engineering, land surveying, and architecture out of planning, and the public does not need protection. And protection of the public health, safety, and welfare is the supposed purpose of registration laws," they argue.

The engineers also fear that, once the planners get basic legal recognition, future amendments and interpretations of the laws might allow planners to make decisions better left to engineers.

The planners have quite different ideas. After a meeting of the National Planning Conference of the American Society of Planning Officials in Denver recently, the group's executive director, Dennis O'Harrow, was quoted as saying that, to be a successful planner, "you must be versed in economics, geography, sociology, political science, law, and public administration, to say nothing of the skills of communication. The engineer sees a road as the shortest distance between two points. The architect winds it around scenically — and in the meantime he knocks out perhaps 500 houses. Somewhere between those two someone has to . . . compromise."

Anyone doubting that New Jersey is merely a test site for planning legislation should read a discussion of the registration question circulated by the American Institute of Planners last March. Planners were advised to:

¶ "Become familiar with the general registration procedures existing in your state. If printed material regarding these procedures is not available from the appropriate state agency, prepare a memorandum for circulation to the local membership for general information as to local procedures.

¶ "Contact the state registration agency or boards (in related professions) and discuss with them the registration situation in your state. Attempt to establish an informal and friendly liaison between the agency or board and the local AIP unit, to receive information from them and to make sure that they know of AIP's existence.

¶ "Discuss, through a committee or authorized representative, with the state planning board and/or 701 agency, the position of AIP on professional registration, and determine the extent to which interprofessional conflicts exist . . .

¶ "Determine which legislative committee of either house of the

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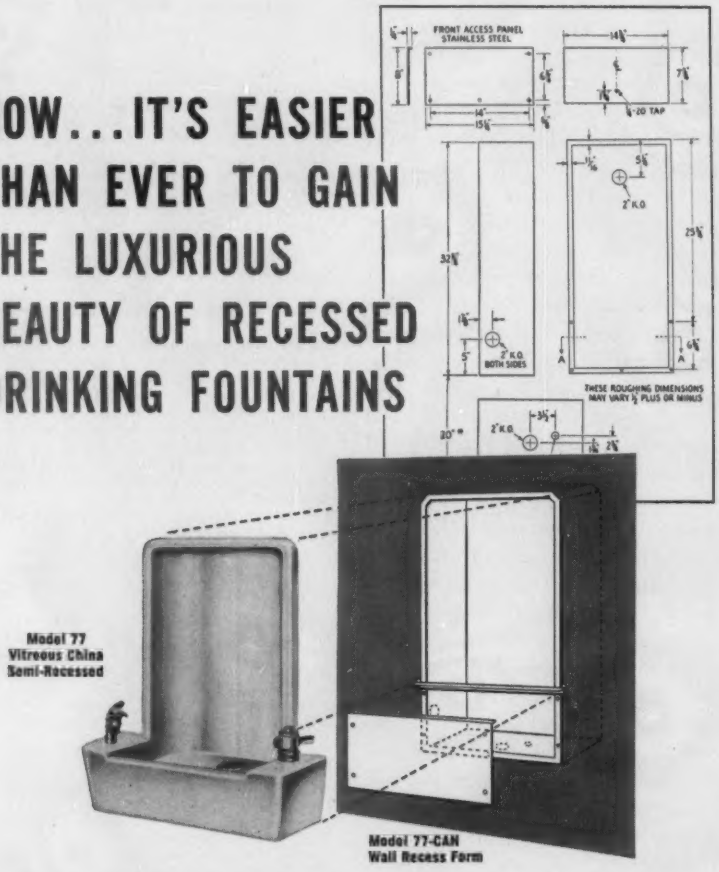

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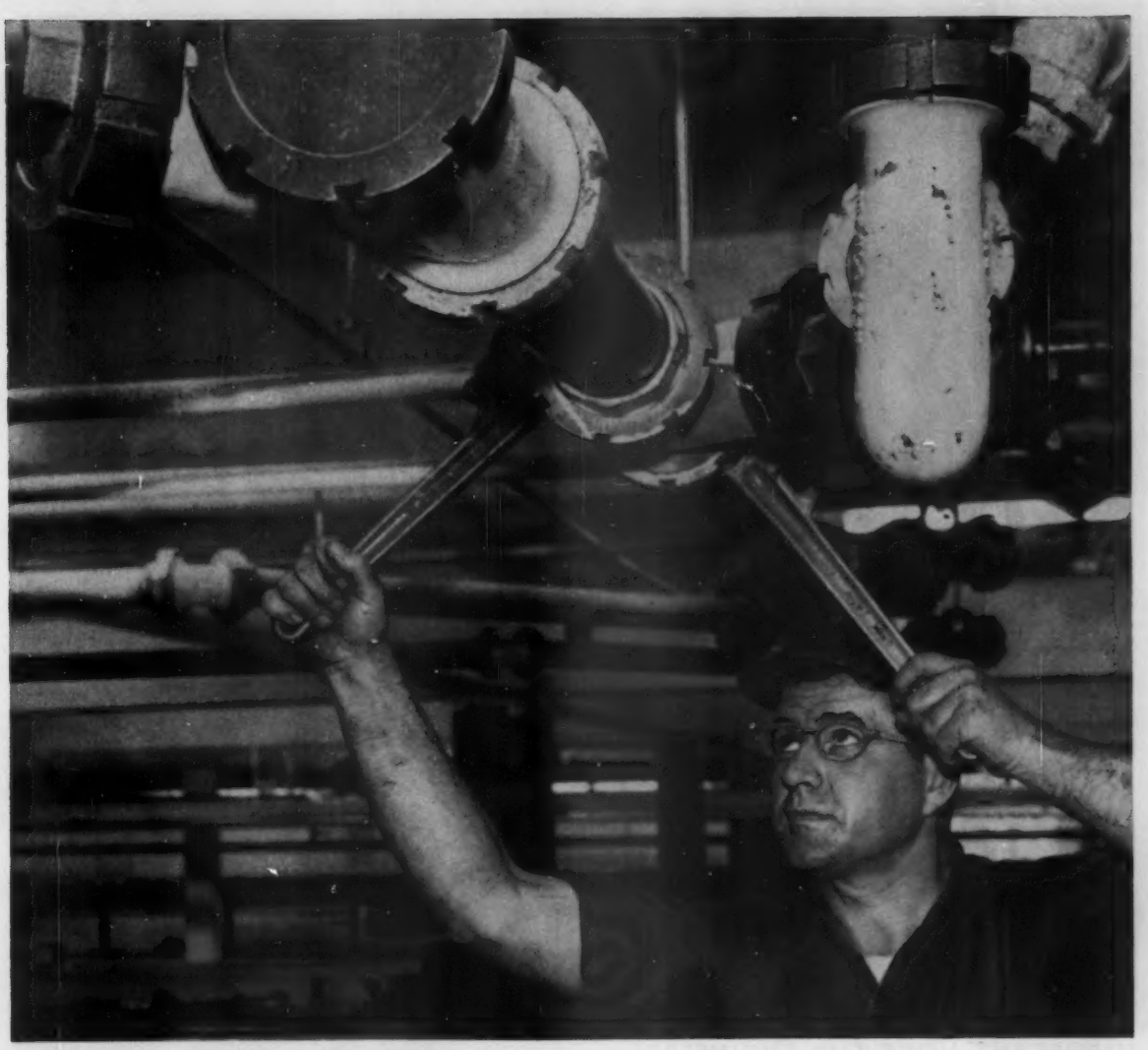

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legislature (exception for Nebraska) is responsible for reviewing registration proposals, and determine appropriate ways to place on file with them the position of AIP with respect to professional registration of planners.

¶ "Establish official contact, in an appropriate manner, with other state professional groups, particularly civil engineers, professional engineers, landscape architects, and lawyers. In pursuing these contacts, remember that joint committees exist at the national level with the American Institute of Architects, American Society of Civil Engineers, American Bar Association, and the Institute of Traffic Engineers. In addition, cordial staff relationships exist, particularly with the American Society of Landscape Architects and the National Society of Professional Engineers, and contact is had from time-to-time with other national professional societies. It is suggested here that you particularly look for the people in the other societies who have an interest in registration matters. Attempt to create personal and informal contact, to establish mutual understanding of the roles of different professions.

¶ "Establish a legislative 'watch dog' service, in order to become immediately informed if professional registration proposals are submitted to the legislature, which apparently would restrict the role and performance of professional planners. Hopefully, this service can be carried out by appropriate state planning, or local planning assistance agencies, as part of their own responsibilities, but in some cases, extra arrangements may have to be made."

Two Points of View

The "cordial staff relationships" mentioned above in reference to NSPE were a little strained in recent correspondence between executive directors of the two groups. In a letter to NSPE, regarding the planning bill submitted by New Jersey engineers, AIP said:

"The American Institute of Planners strongly opposes this legislation. We are sure that you are aware that the great majority of professional planners today are not engineers. Undoubtedly you are aware that there are some 33 different universities in the United States and Canada which offer separate degrees in planning. None of these schools require training or a degree in engineering for admission. We believe that many different professions have a contribution to make to the broad field of planning, but that the professional planner is a person who is trained in a special field of practice which belongs to no other profession.

"The present policy of this Institute is to permit state chapters or sections to pursue registration of a suitable title but we do not approve of registration of practice to confer the exclusive right upon professional planners to practice in

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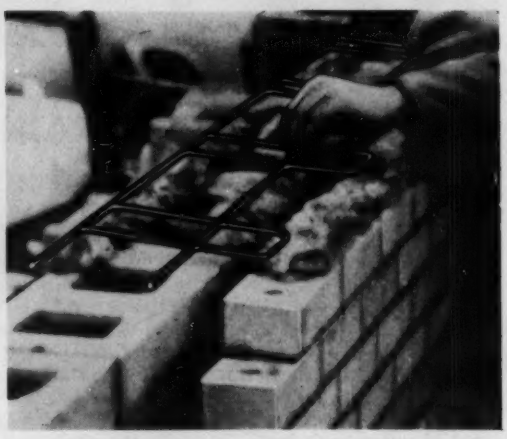

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the field of planning. We believe that this position cannot be maintained and accepted by our members unless other professions cooperate in preventing unqualified registration boards from controlling the right to practice planning."

NSPE, in its reply to the Planners, said:

"We were given to understand that efforts to arrive at a mutually acceptable approach at the state level were unsuccessful because of an inherent difference in desired approach. The New Jersey Society then undertook to resolve the matters through the legislative approach . . . in the pending bill.

"Your letter indicates that AIP is not in favor of a registration statute for planners, but is favorable to local efforts to obtain a law protecting the title of professional planners. Our New Jersey people advised us, however, that the local group of planners in New Jersey had not advanced a title law during this development, but, rather, had pushed for a registration statute under a separate board. We gained the impression that there may be some misunderstanding on this point in New Jersey between the two groups . . .

"Apparently there is some real question in the minds of many whether any form of registration procedure is needed . . .

"We will be happy to participate in any cooperative efforts toward achieving a better understanding between professional engineers and planners at the national level. Likewise, we would hope that this same effort could be made at the state and local levels in conjunction with the NSPE-affiliated state societies and chapters. Under our form of organization and philosophy, the National Society does not attempt to control matters of state legislation; and it would be inappropriate for us to attempt to intervene directly in the New Jersey legislative question. We will, however, provide any desired assistance to the New Jersey Society of Professional Engineers in such cooperative efforts as they may undertake to work out the mutual problems of the two groups at the state level."

Other groups also are concerned with the question of who should do planning. At a recent meeting of the American Congress for Surveying and Mapping, a panel discussion was held on the subject. Sample remark:

"Methods in the subdivision of land have progressed far beyond the old methods. If the surveyor or engineer does not keep pace with the times, this work will be handled by those who do. This is more evident every day and is a greater threat than most realize."

A committee of the American Society of Civil Engineers also has studied the question. They decided that almost everyone is doing planning of one kind or another, and that civil engineers are very good at planning.

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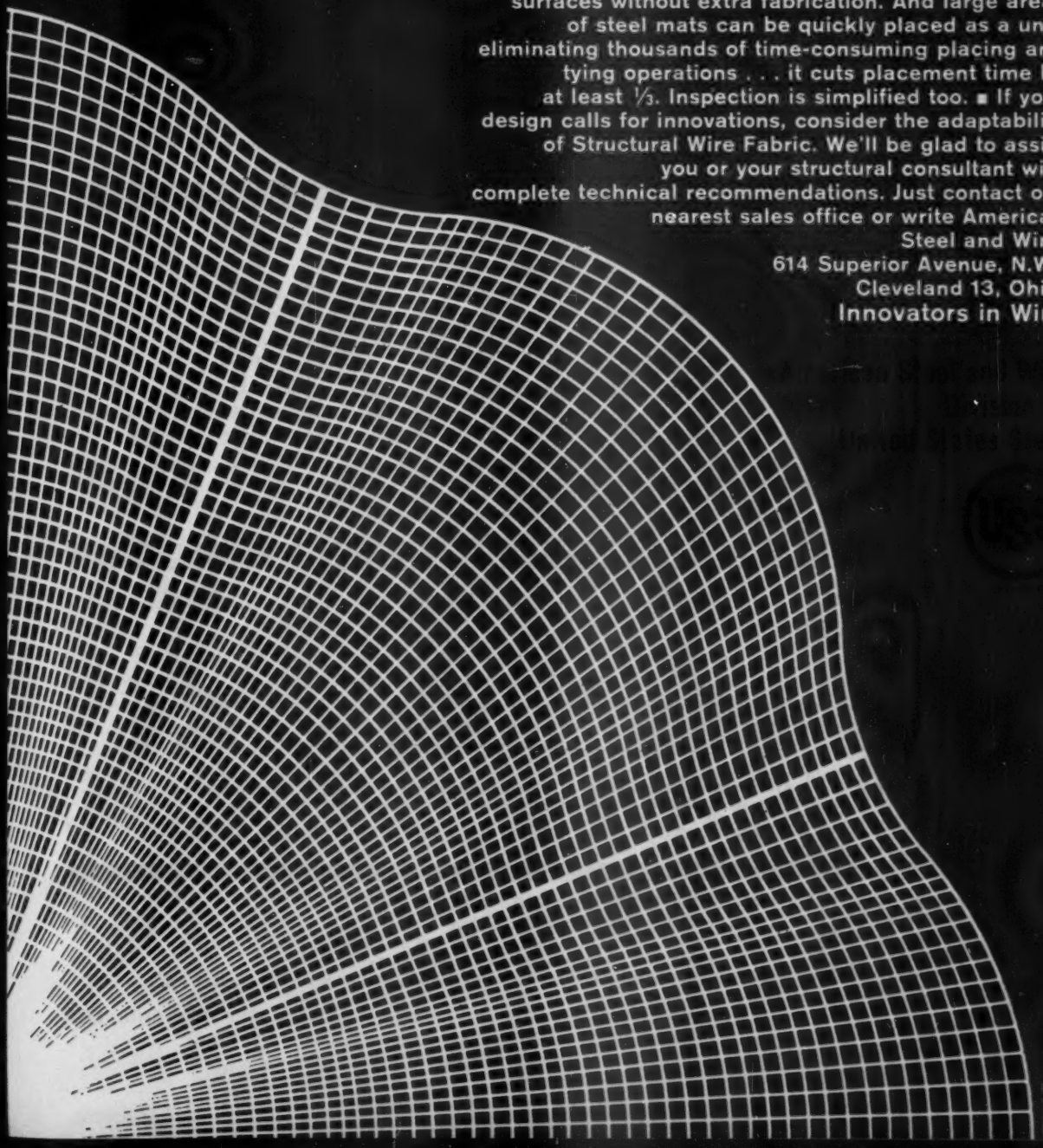

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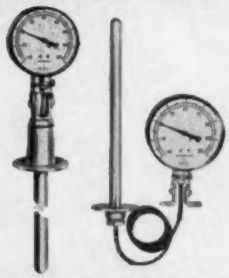

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MARJORIE ODEN,
Eastern Editor

More on Fees

The General Accounting Office, in a study of the Federal Aid Highway Program in New Mexico and Wyoming, has continued its battle against percentage fees. "It is our view that the amount of fee should be dependent upon such factors as the technical competence required and the extent and complexity of the work to be performed, and should not vary with the cost of construction of a project."

The GAO, which first began the battle against percentage fees in a study of the Federal aid program in Louisiana, Oklahoma, and Arkansas, explained that the Bureau of Public Roads does not agree with the antipercentage fees stand, but the Bureau's position "was not positive."

"From January 1956 to August 1959, 23 contracts for consultant services were awarded by the State (New Mexico). On six projects, included in these 23 contracts, for which construction contracts had been awarded at the time of our review, the consultants' percentage fees computed on the basis of engineers' estimates totaled $261,229. On the basis of awarded contract amounts, the fees would be $225,932 — a difference of $35,297.

". . . According to the Bureau, this method of contracting is controlled by including in the contract (1) predetermined unit prices to be used in the preparation of estimates and (2) the design standards and principles to be followed by the consultant. It would appear that these controls were not effective for the contracts cited since the use of a percentage fee applied to estimated construction costs resulted in increased fees when compared with . . . fees on the basis of actual awarded contract amounts.

"We believe that, in those instances where the extent or cost of work to be performed by a consultant is not readily determinable, state use of a cost-plus-a-fixed-fee method of contracting would be an appropriate method . . ."

Corporate Practice

There is a new wrinkle in corporate practice bills which have been passed in six states, are pending legislative action or governors' approval in seven others, and were introduced and defeated in seven additional states during the current legislative year. The wording of many of the bills is almost identical, denoting common parentage, but none was introduced with engineering specifically in mind.

The bills generally are called Professional Corporation or Professional Association Acts. Most do not mention the word "engineering," although the language is broad enough to cover it.

In Arkansas, the bill as enacted is limited to doctors and dentists. In Minnesota and South Dakota, the approved bills apply to doctors only, but other bills in this series apply to all professions.

In addition to the three states named, Florida, Georgia, and Tennessee have enacted professional corporate laws, and similar legislation is either pending before legislatures or awaiting governors' signatures in Alabama, Illinois, North Carolina, Ohio, Oklahoma, Pennsylvania, and Wisconsin. Bills failed in California, Connecticut, Indiana, Iowa, New York, Oregon, and Rhode Island.

A sample bill states that:

"The term 'professional service' shall mean any type of personal service to the public which requires as a condition precedent to the rendering of such service the obtaining of a license or other legal authorization, and which prior to the passage of this act and by reason of law could not be performed by a corporation. By way of example and without limiting the generality thereof, the personal services which come within the provisions of this act are the personal services rendered by certified public accountants, certified accountants (sic), chiropractors, dentists, osteopaths, physicians and surgeons, doctors of medicine, doctors of dentistry, podiatrists, attorneys at law, and life insurance agents.

"The term 'professional corporation' means a corporation which is

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organized under this act for the sole and specific purpose of rendering professional service and which has as its shareholders individuals who themselves are duly licensed or otherwise legally authorized within this state to render the same professional service as the corporation."

Other interesting requirements of the bills — "The corporation shall be liable up to the full value of its property for any wrongful acts or misconduct committed by any of its officers, shareholders, agents, or employees while they are engaged on behalf of the corporation in the rendering of professional services." and "No corporation organized under this act shall engage in any business other than the rendering of the professional services for which it was specifically organized and for which the franchise was granted."

Elsewhere on the corporate practice front, the Model Law, with modifications, has been adopted in Rhode Island. The primary change was allowing corporations to practice through professional engineers (whereas the Model Law only allows engineers to practice through corporations).

In Connecticut a corporate practice bill died in committee. Another bill, which would have allowed only four companies formed prior to 1935 to practice as corporations, was vetoed by the governor.

In Illinois, where the engineering groups have had a little trouble deciding what they wanted in the way of corporate practice, a bill was introduced allowing corporations to practice engineering providing: the principal business of the corporation is the practice of professional engineering; the chief executive officer or managing agent of the corporation is a registered professional engineer; a majority of the directors of the corporation are registered professional engineers; all plans, designs, drawings, reports, and specifications issued by or for the corporation are drafted

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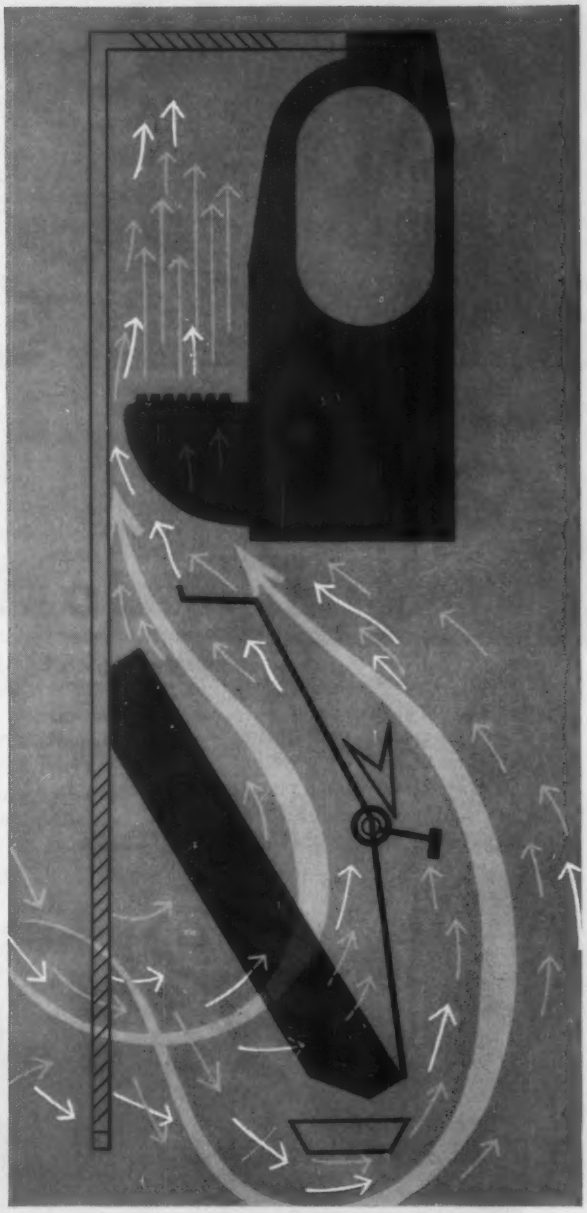

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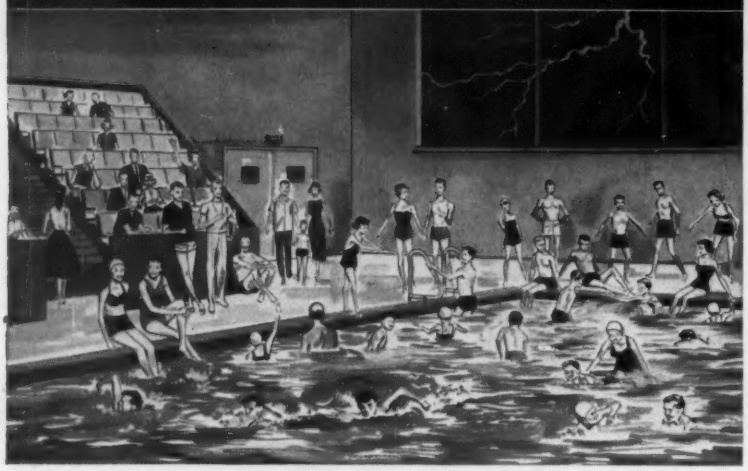

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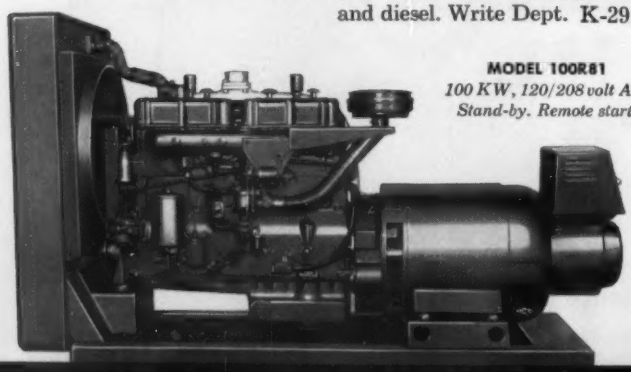

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and are dated and bear the signature and seal of a registered professional engineer of Illinois; and previously existing corporations who have been legally practicing engineering in Illinois prior to the passage of this amendment shall not be subject to the above restrictions. The bill is now before the governor for approval (see p. 30).

Model Law Change

The Southeast Zone of the National Council of State Boards of Engineering Examiners is planning to submit a substitute provision for corporate practice as an amendment to the Model Law at the NCSBEE meeting this month in Biloxi, Mississippi.

The new provision reads:

"The right to engage in the practice of engineering shall be deemed a personal right, based on the qualifications of the individual as evidenced by his certificate of registration, which shall not be transferable. Any registered professional engineer may practice his profession individually or through a partnership, joint stock company, or corporation, as agent, employee, officer, or partner, provided he shall be individually liable for his professional acts and provided further that the partnership, joint stock company, or corporation through which he renders such engineering services, shall be jointly and severally liable with such individual registered professional engineer, and further provided, in the case of such corporations, that: the majority of the shares of the corporation's voting stock shall be owned by individual registered professional engineers, and the majority of the directors and of the officers shall be registered professional engineers. The individual engineers in responsible charge of the practice of engineering shall be registered in this State; and all final plans, designs, drawings, specifications, and reports involving engineering judgment and discretion, when issued, shall bear the seal and

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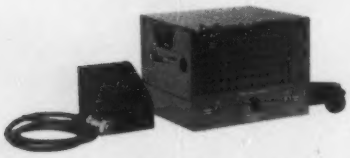
No matter whether you're coating a pipeline or a chemical tank, continuity is vital. Use of a Tinker and Rasor Holiday Detector while the job is open, can save days of downtime later on.

• PLANT AND YARDS

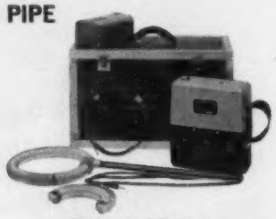


Tinker and Rasor
EPAC Holiday Detector or J-1ACM

EPAC operates off 110 volts A.C. power for stationary coating operations. Internal voltage adjustment from 5,000 to 20,000 volts or with external variable transformer from 500 to 6,000 volts, or 5 KV to 20 KV.

J-1ACM for continuous inspection on coating and wrapping machines which use water for cooling.

• PIPE



Tinker and Rasor
E-P or E-4 Holiday Detectors

Output adjustable from 5,000 to 20,000 pulsating voltage.

E-P—All purpose for larger diameter pipe, damp or dry climate, pre-fab film or hot applied coatings.

E-4—Lower cost, dry surface type of detector specifically designed for smaller diameter pipe and flat surfaces.

• THIN FILM

Tinker and Rasor
M-1 Holiday Detector

For painted or sprayed thin film coatings such as vinyls and epoxies. Maximum applied voltage 67½ V., non-destructive to coatings. Belt mounted, 4-lbs. total weight.

• UNDERGROUND

Tinker and Rasor
Pearson-type Holiday Detector

For detecting holidays and electrical shorts without uncovering the pipeline. Completely transistorized . . . generates 15 watt, 750 cycle, stable A.C. Audio-frequency signal. Adaptable to null search method.

Tinker and Rasor has prepared a complete data kit which describes the null search system as well as other recommended procedures for inspecting protective coatings. Material includes technical data on equipment, general discussion of types of detectors, theory of operations, etc.

Engineering Note:
To insure a perfect application, include Tinker and Rasor Holiday Inspection. Write for specification guide.

Quality Control for Coating Application

TINKER & RASOR

417 Agostino Road, P.O. Box 281 • San Gabriel, California

signatures of the registered professional engineers who are in responsible charge. Nothing contained herein shall be construed to prevent any business entity which is engaged primarily in the manufacture of products, or the extraction or processing of raw materials, from providing engineering services for its own use or business, provided, however, that such engineering services shall not be offered to the public as such."

ASME Meeting

Highlight of the American Society of Mechanical Engineers' recent sessions in Los Angeles was discussion of a management consultants' study on what is wrong with the Society, and how it can be corrected. Although no action was taken on the consultants' findings, most of the suggestions have been referred to the various committees, and President William Byrne, who summarized the report in his speech, promised prompt action on committee recommendations.

Byrne pointed out that the basic problem in ASME currently is membership. Although ASME has consistent gains, its losses are equally consistent, resulting in a static membership total. ASME is taking another look at its objectives, trying to decide whether to reduce the number of "fringe fields" it serves, or to decentralize and expand.

Another look is being taken at public relations, with an attempt to have headquarters personnel give more personal attention to sections. Also, student chapter needs are being studied as the possible answer to the growth problem.

Byrne mentioned that the management consultants have suggested the secretary be given more freedom and authority, along with a title change from "secretary" to "executive secretary." Committee jurisdiction also is being studied. Since taking office, Byrne has concentrated on an attempt to get more ASME members to take an active interest in committee work

HOLDS TIGHT AGAINST SEVERE VIBRATION

W-K-M's Non-Lubricated Eccentric Plug Valve

This valve is located close to a piston pump handling a heavy and abrasive sewage sludge. Since it was installed more than a year ago in this modern sewage disposal plant, it has made a record of perfect performance — *no effects from severe vibration, no leaks, no maintenance, no repairs.*

Severe vibration was destructive to all previous valves which — frequently and at random — worked open or closed causing almost perpetual stem and line leakage. Constant attention and maintenance were required.

W-K-M's Eccentric Plug Valve is ideal where such severe conditions are involved. Its unique design allows it to maintain its open or closed position regardless of vibration or other shocks. The resilient elastomer bonded to the plug efficiently resists the abrasive action of sludges or other solid-bearing liquids.

Write for full information, P. O. Box 2117, Houston, Texas.

When So Much Depends on a Valve

. . . *Specify* **W-K-M**

W-K-M
DIVISION

ACF INDUSTRIES

maintenance
costs
come
down
with
the
lights!
with servisafe engineered
lighting systems by Thompson
In congested areas, lighting fixtures can be automatically disconnected and serviced on the ground. There's no need to invest in special equipment to reach up to the lights. Simply specify Thompson Servisafe poles . . . the perfect solution to safe and rapid lighting maintenance at the lowest possible cost.
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Request specifications and details for installations.
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TE

and to get committee assignments completed on deadline.

New York Association

The public relations committee of the New York Association of Consulting Engineers is preparing three publications to be released within the next six months.

The first, which has been completed, is a brochure for members. This contains historical data on the Association, a copy of the bylaws, and the membership roster.

The other two, to be finished after the first of the year, will be a brochure aimed at the general public (explaining the aims of the Association, who the members are, and how the consulting engineer serves the client); and a discussion of fees. The latter will be designed for engineer-client discussions, but not for general distribution.

Pollution Consultants

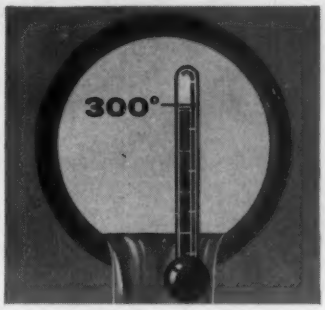
A group of consulting engineers interested in atmospheric pollution held a formative meeting during a recent convention of the Air Pollution Control Association.

This group, which will function as a committee of APCA, will define a consultant in terms of air pollution control work; establish the role of the consultant; publish constructive information on plant-consultant relationships; provide a listing of active consultant members of APCA; and advance the recognition and stature of the air pollution control consultant within the scope of the organization.

According to E. R. Roth, chairman, "The initial discussion quickly established that the term 'consultant' is a confusing one because of the various categories of air pollution control work and the many different approaches to the problems. If we can merely define the 'consultant,' we will have made a good beginning."

New Building?

The American Road Builders' Association is fund-raising for a new



PROTECTION . . . THAT REALLY WORKS!

If you've ever had a pipe deteriorate, you know how serious it can be. Fibercast stands up where others simply won't do. Produced under a carefully controlled manufacturing process, its solid centrifugally cast walls provide positive protection against high temperatures in corrosive environments.

FIBERCAST® epoxy pipe safely handles corrosive solutions to 300° temperatures

Rugged pipe carries 94% of known corrosive solutions. Available now in sizes from 2" to 8"

Heat and corrosion failures cost money. That's why it's important to consider the maximum protection you get with Fibercast epoxy pipe. Protection against premature fouling, generally attributed to operating temperatures and corrosive solutions. Protection against intermittent replacements, downtime—added costs for new materials and labor.

Years of actual operation in field use, prove Fibercast outlasts other kinds of pipe. Even more expensive metal pipe, or pipe with thermoplastic interior coatings cannot match Fibercast's resin rich interior.

Comparative Life Data

Report after report shows that Fibercast does outperform other types of pipe in terms of long service life. Basing Fibercast Grade J at 100% as unit life, comparable ratings show: Aluminum, 26%. Brass (RED), 74%. Rubber Hose, 21%. Stainless Steel (304-40), 31.1% Asbestos (cement C-100), 23.7%.

Handles 94% of Known Corrosive Chemical Solutions

Out of 338 common corrosive solutions, Fibercast safely handles 320. Not only does it provide superior resistance to corrosion, heat and pressure—it also has the outstanding ability to maintain the purity of the solutions it carries. The pipe has a glass-smooth interior with a Hazen-Williams C-Flow Factor of 147. This cuts friction losses. Encourages flow at intended pressures. Resists deposit build-up. Dielectric properties ward off electrolytic action.

Fibercast owes its long life—and its special resistance to heat, pressure, corrosion, contamination, electrolytic action—to the exclusive way it is built. Fibercast is a centrifugally cast thermoset epoxy resin reinforced pipe with multiple layers of seamless braided glass fiber sleeving or especially woven glass fabric. Its body of woven glass fibers, impregnated with epoxy resin chemically cured at elevated temperatures provides remarkable ability to withstand high pressure and temperature in corrosive environments.

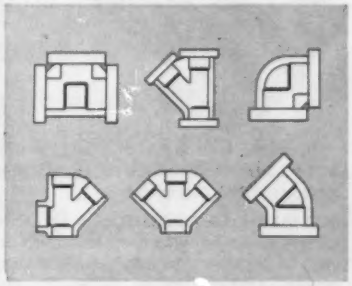
FIELD USE PROVES RESISTANCE TO CORROSION . . . 1 Plastic-coated steel nipple (right), used in salt water supply well, corroded and lost strength after 3 months. Fibercast (left), used in same installation for 3 *years* still shows no loss of strength.

Savings Right from the Start

Fibercast puts you way ahead for your money from time of installation. Light weight makes it easy to handle; (it is one-fourth the weight of steel). Yet it even has structural stability and strength for installation on span racks with the normal metal pipe spacing.

Complete Line of Fittings

Fibercast offers fittings to solve any fitting problem. Besides a vast stock of standard sizes and types, Fibercast also designs and makes special fitting to meet individual problems. All have the same corrosion resistance properties of Fibercast Pipe and Tubing.



Get the full story on Fibercast Pipe, Tubing and Fittings. Find out how they can help you solve and combat specific problems relating to temperature, pressure and corrosion. Mail coupon today.

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Box 727, Sand Springs, Oklahoma
Please send me, without obligation, further details about Fibercast Pipe, Tubing and Fittings.

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Type of Business _____
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FIBERCAST® COMPANY
A DIVISION OF Youngstown SHEET AND TUBE COMPANY

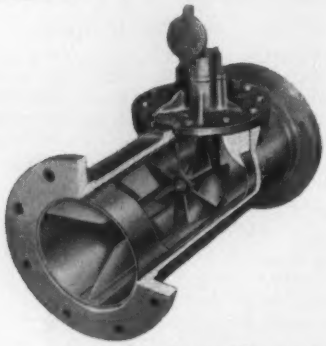
SPARLING METERING TOPICS

Propeller Meters With Full Pipe Size Bore Cut Head Loss

Negligible head loss eliminates the need for pressure recovery equipment.

This is one of the many advantages of propeller type meters in main-line service. The straight bore of the Sparling meter assures uninterrupted flow, regardless of flow rate or pressure variations.

A further contributing factor to low head loss is the propeller. Molded of tough, resilient plastic with a specific gravity of .93, it literally "floats" in the line and rotates on self-flushing, anti-friction bearings which are virtually drag-free.

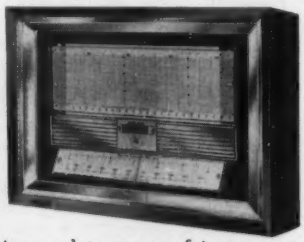


Pressure loss with Sparling meters 8" or larger is less than 3" of water at average rated velocities.

INSTALL IN ANY POSITION...Propeller meters function with the same high degree of accuracy in any position—horizontal, vertical, or on an angle—and can be placed in either pump suction or pump discharge piping.

ACCURACY...Sparling propeller meters are guaranteed accurate within 2% of true flow at all flows within the rated range of the particular meter. Each meter is tested and then individually geared and calibrated to maintain consistent accuracy.

DIRECT TOTALIZATION...The primary function of a propeller meter is totalization. Reading is direct without the need of conversions or additional computations. Sparling propeller meters register total flow on a 6 digit straight reading totalizer in any standard volumetric unit desired. If instantaneous rate of flow information is also required, an Indicator-Totalizer can be installed on the meterhead which gives continuous data on both volume and velocity.



A complete range of instruments is available for use where readings are to be made at locations remote from the meter itself.

LOW MAINTENANCE...Moving parts are few in a propeller meter and close-tolerance manufacture gives many years of accurate, trouble-free operation. Periodic lubrication and inspection is usually all the maintenance required. When further service is needed, the entire metering unit is easily lifted out of the line with minimum shut-down time.

METERS FOR EVERY NEED...There is a complete line of Sparling meters, instruments and controls to meet every main-line metering need. Sparling equipment has been proved in nearly half a century of use in cities across the country and around the world.

Ask your Sparling field engineer for complete information, or write direct for Catalog 315-CE.

SPARLING WATER CONTROL EQUIPMENT

HERSEY-SPARLING
METER COMPANY
Sparling Equipment: EL MONTE, CALIF.
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United Kingdom Affiliate: TYLORS OF LONDON LTD.

headquarters in Washington. Current plans — still tentative — call for a $370,000 building with enough future expansion space to bring in about $20,000 a year in rentals.

Spotlight on Education

More than one year after the National Science Foundation-sponsored conference on civil engineering education was held, participants have come to the conclusion that what civil engineers need is a five-year education.

For the American Society of Civil Engineers, this sentiment is not a new idea. About five years ago, a Task Committee on Professional Education, headed by Adolph J. Ackerman, suggested the five-year degree program as a solution to the problem of giving young civil engineers an adequate background in both technical and humanistic subjects. At that time, the committee suggestions were not adopted by ASCE, and the current proposal still must go before the board before becoming stated policy.

Under the proposed five-year program, the first four years' study would lead to an undergraduate degree (Bachelor of Engineering), and the fifth to a graduate or professional degree (possibly Master of Civil Engineering).

According to the resolution, the four-year program would emphasize "humanistic-social studies, mathematics, and basic and engineering sciences, with at least three-quarters of the program interchangeable among the various engineering curricula; to be followed by a professional or graduate civil engineering curriculum based on the pre-engineering program and leading to the first engineering degree, with a civil engineering degree awarded only at the completion of the . . . curriculum."

The resolution also requested the support of Engineers Council for Professional Development and the Engineers Joint Council.

Earlier, ASCE discussed the problems of surveyors' education

WILL YOUR INSULATION PERFORM ACCORDING TO THE SPEC?

there's a foster protective system to help make sure it will

When the thermal-insulation specification includes the name "Foster," you're assured a protection system engineered to resist practically every condition the insulation can be expected to encounter. And only with the proper protection will the insulation perform efficiently.

There's no such thing as "or equal" when it comes to protecting your costly investment in insulation. Only the Foster system in the specifications can be relied on 100% to fill the bill.

Foster insulation-protection research has developed adhesive, vapor-barrier, and coating systems to meet virtually every conceivable thermal-insulation requirement. A letter or call outlining your problem will bring one or more Foster Bulletins which should contain an appropriate solution.

Thermal Insulation Protected By foster Fire Resistive Specifications

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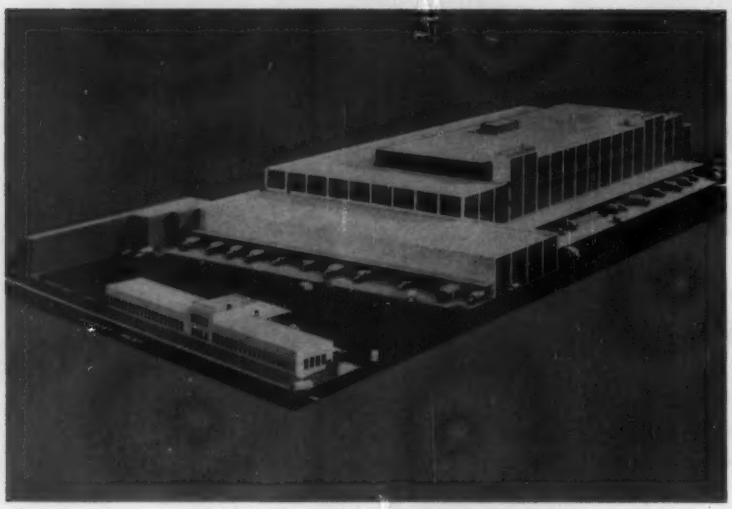
MEARS low-voltage circuit breakers . . .

Designed for modern Public Buildings



Portland, Oregon's new $10 million multi-purpose public building scheduled for completion in 1962 is being equipped with MEARS trouble-free FUSED CIRCUIT BREAKERS. **Architect:** Stanton, Boles, Maguire & Church, Portland, Oregon. **General Contractors:** Anderson-Westfall Co., Inc., Portland, Oregon. **Electrical Contractor:** Watco Electric Co., Portland, Oregon. **Consulting Electrical Engineer:** Grant Kelley & Associates, Portland, Oregon. **Mears Representative:** H. G. Lehl, Oswego, Oregon.

MEARS FUSED CIRCUIT BREAKERS GUARANTEE RELIABLE POWER PROTECTION

Specifications on this $10 million installation called for breakers that would meet the high interrupting requirements . . . economically . . . compactly. Mears fused breakers were specified because of their high interrupting capacity . . . guaranteeing complete and reliable power protection in a very compact unit.

MEARS—ENGINEERED AND TESTED FOR RELIABILITY

For example, in a recent test, a 1600 ampere fused breaker closed successfully against a 170,000 ampere fault. All Mears air or fused circuit breakers are completely tested to give safe performance margins above standard NEMA test requirements.

Other MEARS-ENGINEERED features include a variety of frame sizes from 600 through 4,000 amperes, and a variety of construction types . . . FIXED, PLUG-IN, and DRAWOUT mountings.

See the **"MAN FROM MEARS"** in your area . . . or write department CE-8 for our new Circuit Breaker Catalog.

MEARS CONTROLS *Inc.*
13725 S. W. Millikan Way • Beaverton, Oregon

and the board adopted a resolution stating:

¶ "Civil engineering faculties should be encouraged to provide appropriate instruction in surveying by qualified personnel.

¶ "Some of the engineering schools throughout the country should provide an elective sequence of surveying and mapping subjects that would constitute, in effect, an undergraduate major in survey engineering (or geodetic engineering or geometronic engineering).

¶ "Some engineering schools should offer graduate-degree programs in major specialties of the survey engineering field, such as: land surveying, geodetic, cartographic, and photogrammetric engineering . . ."

Trouble in Texas

The Texas Society of Professional Engineers is making another try at getting an injunction to stop Dalton, Hinds & O'Brien Engineering Company, of Houston, from practicing engineering. In previous battles, the engineering firm has been the winner.

Earlier this year, a district court dismissed a suit brought by TSPE charging the firm with misuse of the word engineering, and charging the president, R. G. McCauley, with misuse of his registration. Last year, the attorney general had been asked for a ruling to clarify the laws. He had stated that a corporation cannot get an engineering license, but that it is "not required to obtain a license to do what is permitted by Section 17."

In the amended petition, TSPE asks that the four officers and owners of the company be "perpetually enjoined from engaging or from exerting the controls of ownership and management over professional engineers employed by a corporation in which said defendants own an interest." The petition also asks that McCauley be stopped from doing engineering work, "under the direction and supervision of persons who are not registered professional engineers." ▲▲

Why so many Birmingham schools heat with LO-BLAST GAS burners

"With the style of architecture we want here in Birmingham, we find that it's more practical to have small gas-fired boilers in each school building rather than build a central plant and pipe heat to each building," says Mr. Fred J. Kelley, Business Manager of the City Board of Education.

"That's one of the reasons why we specified Lo-Blast Power Gas burners for many of our new schools. These units adapt most easily to the boilers we use. What's more, they have a very good record here in Birmingham for safe, consistent performance plus low-cost installation and operation."

Gas heating can give your schools safe, economical service—especially with the new Lo-Blast burners made by Mid-Continent Metal Products. For complete information, check with your local gas company's Heating Specialist, or write Mid-Continent Metal Products Co., 1960 N. Clybourn Ave., Chicago 14, Illinois.

AMERICAN GAS ASSOCIATION

Economite and Lo-Blast Power Gas Burners operate silently, cost less to install, are well suited for down-draft boilers, and are available in capacities from 70,000 to 20,000,000 BTU.

FOR HEATING ... GAS IS GOOD BUSINESS!

"Quote . . . End Quote"

Preserving Our Freedoms

"To preserve our free way of life through the constitutional government as founded by our great forefathers, it is important that American citizens and local governments assume more responsibility of governing themselves and rendering services now provided by the Federal government. Excessive government spending must result in higher taxes or deficits — both of which will eventually destroy our free economy. Every individual citizen must realize that only people pay taxes, even though taxes are levied on business. It is, therefore, up to the people to demand more efficient governmental operations." — from *Chemistry in Action*, published by Truesdail Laboratories.

Moses Offends Architects

"Things continue to move resolutely backward out at Flushing Meadow Park, headquarters of the 1964-65 New York World's Fair. Speaking at Brandeis University, Fair Fuehrer Robert Moses gave the design philosophy — or lack therefore — of the exposition: 'The Fair administration belongs to no architectural clique, subscribes to no aesthetic creed, favors no period or school, and worships at no artistic shrine. . . There will be no predominating architectural concept.' The man to whom AIA once — for some reason — gave its Allied Professions Medal said, 'I get a little weary of the avant garde critics who see in a World's Fair only an opportunity to advance their latest ideas, to establish a new school of American planning, architecture, and art, and place their individual seal on one grand, unified, integrated concept which will astonish the visitors from the hinterlands and rock the outer world.' Having thus cavalierly dismissed the latest ideas, a new school of American planning, architecture, and art, and concepts which would astonish and amaze, Moses said that his administration's message to potential exhibitors is that '. . . we don't care whether you are a traditionalist, modernist, or eclectic. The exhibitor makes his choice. Fair officials who issue a blanket invitation to all comers need not lean toward the smugness of the traditionalist or yield to the exigency of the avant garde, nor sit with the eclectics. They have no position at all except as benign spectators.' "— *Progressive Architecture*, June 1961.

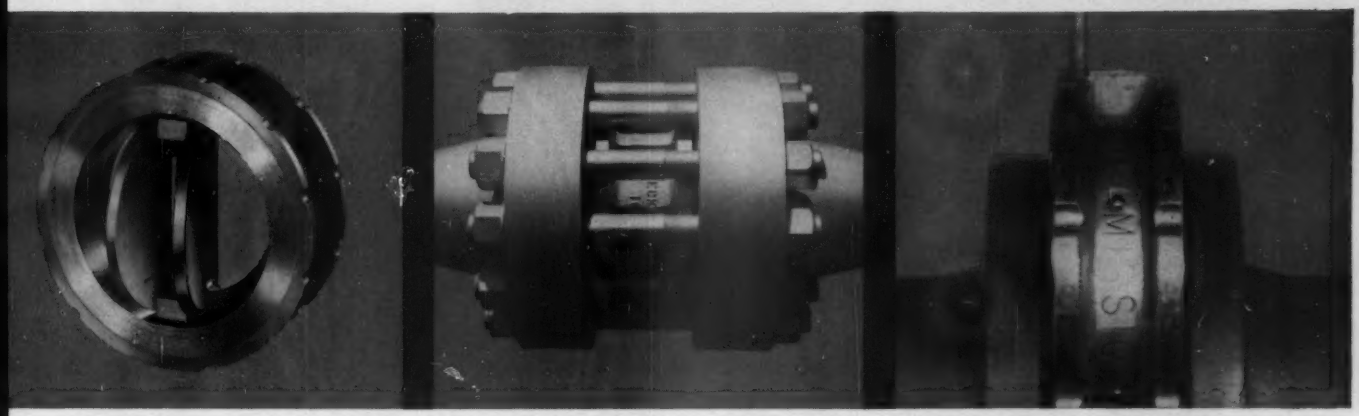
Highway Engineering Education

"There is another area where all the elements are present for some of our engineering schools to go overboard in response to the impact of a newer technology. That is electronic computers. Because highway engineers were accustomed to equipping young engineers with a desk calculator and having them calculate their heads off all day long, as a part of the process of getting out plans, highway engineers were among the first to apply computer techniques widely in engineering.

"What these young engineers had been doing with the desk calculators was not engineering, but we called it engineering. I do not believe, however, that our engineering schools should install courses designed to produce computer operators. Rather I think they should concentrate on introducing the students to computer application, simply to familiarize them with the potentialities of this tool and to dissipate their natural inferiority about these electronic devices. This aim might be accomplished with a couple of lectures and a few stiff problems a week for one semester. One of the big difficulties here is obtaining trained faculty for these courses. The regular faculty in most cases received their own training before the advent of computers. . . .

"In summary, most of the firms in private practice which engage

COSTS LESS—WEIGHS LESS—EASY TO INSTALL

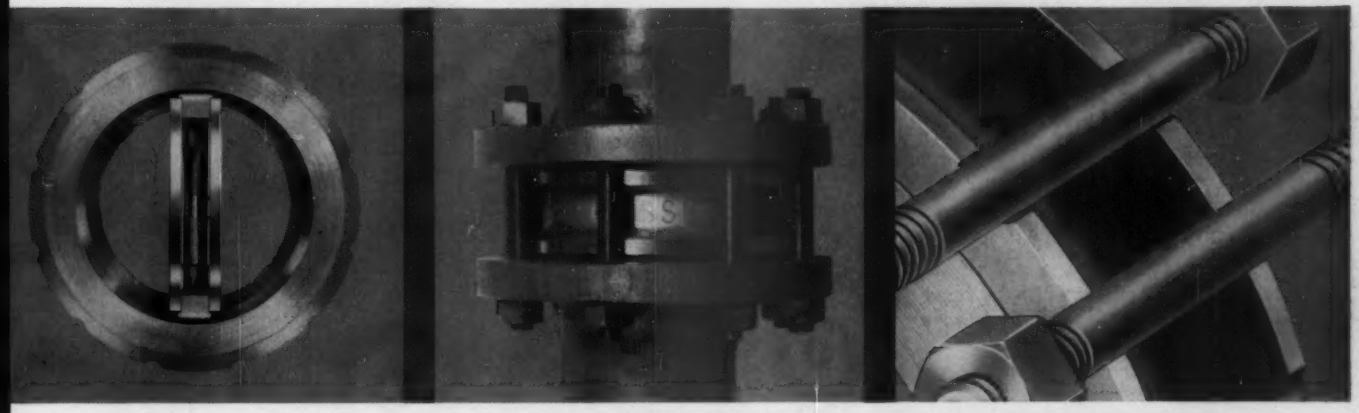


Because of its sound, imaginative design, the Duo-Chek check valve is smaller, uses less material, and costs less to buy. It costs less to maintain and lasts longer, too.

A Duo-Chek check valve weighs on the average less than ten per cent, with some models weighing only two per cent, as much as conventional check valves for the same service. No foundations are needed.

The Duo-Chek fits between the flanges, is smaller and weighs less. For example, a 6-inch steel valve, series 300, weighs 29 lbs., requires no special installation equipment.

NO SLAM—ANY POSITION—CUTS INVENTORY



A stainless steel coil spring effects positive sealing action. The quick action of the spring closes the valve before reverse flow can occur. Result: No slam, no water hammer.

The Duo-Chek simplifies piping arrangements. The spring loaded plates operate in any position. Most popular sizes can be installed even in vertical lines with downward flow.

The unique versatility of the Duo-Chek greatly reduces inventory. In sizes 2 through 12 inch, one valve fits both series 150 and 300 flanges; 2- and 3-inch sizes fit series 600, too.

MISSION **DUO-CHEK** CHECK VALVE

The Mission Duo-Chek® check valve performs all regular check valve duties, yet is smaller, lighter, and easier to install. Duo-Chek check valves are available in a complete range of sizes from 2 to 48 inches, ASA Series 125 through 2500. They come in various end connections, such as raised face, ring joint, weld neck, etc. They are made in carbon steel, stainless steel, aluminum, and bronze. Special alloys are available. Because of the small size of the Duo-Chek, special alloy valves cost much less than conventional valves in the same alloy.

Sealing material is bonded in a groove in the plate. The sealing material makes an O-ring seal, which pressure deforms until metal-to-metal contact is made by the plate and body seat. Sealing material may be Buna-N, Teflon, Viton, or metal, depending on the service.

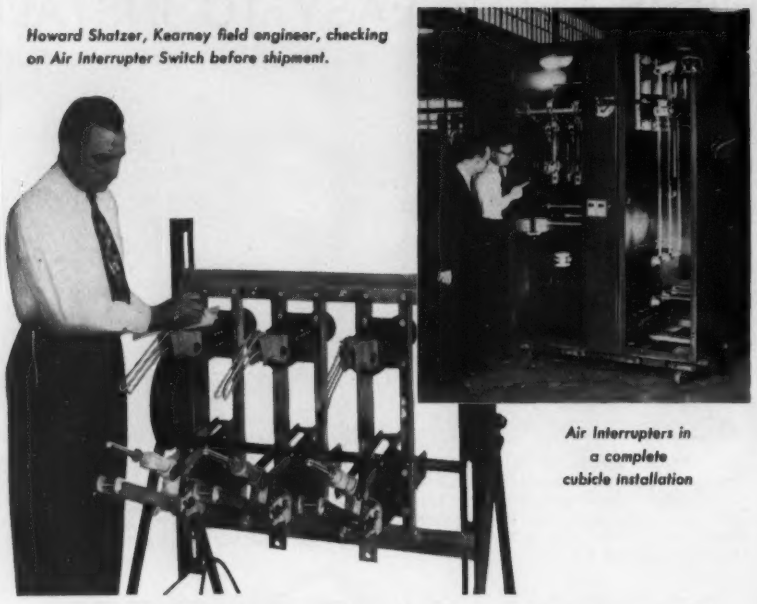
The simplicity of design of the Duo-Chek pays off in every installation with longer life and less maintenance. Only six parts are contained within the body of the Duo-Chek, held without the use of internal fasteners or joints of any kind. All parts are interchangeable.

The Duo-Chek is much lighter in weight than conventional check valves, yet is stronger. By dividing the opening, the unsupported plate area is reduced so that each plate requires only one-eighth of the weight of a conventional clapper of the same strength. The short stocky body is inherently stronger and more rigid than a short length of heavy wall pipe.

Whatever your check valve application, the Mission Duo-Chek can cut initial purchase and installation costs, cut maintenance costs from then on. Contact Mission now for a representative.

MISSION VALVE AND PUMP CO. A SUBSIDIARY OF MISSION MANUFACTURING CO. P. O. Box 4209, Houston, Texas • Cable Address 'MISSCO' • Export Office: 30 Rockefeller Plaza, New York • In the United Kingdom: MISSION MANUFACTURING CO., LTD., 1 Hanover Square, London W. 1 England • Cable Address 'MISSOMAN' • Sold by Mission Manufacturing Company outside of Canada and the U.S.A.

MISSION VALVE AND PUMP CO.



Howard Shatzer, Kearney field engineer, checking on Air Interrupter Switch before shipment.

Air Interrupters in a complete cubicle installation

Specify KEARNEY...

for safe AUTO · SPEED interruption

in metal-enclosed switchgear

What is **Auto-speed interruption?** . . . An automatically produced interruption that always occurs at the same point in the switching operation, and always takes the same time (one-half cycle). Human error is eliminated from the switching action by a trigger spring mechanism which trips the switch at a pre-set point. Contacts are separated inside a dry type interrupter unit.

Specify safety for personnel and equipment. No exposed Arc. Kearney Air Interrupter Switches will not produce external arcing dangerous to men or equipment.

Specify economy. Costing less than circuit breakers and with interrupting capacity not found in air break disconnects, Kearney Air Interrupters are ideal for . . . interrupting magnetizing charging current of transformers . . . interrupting charging current of lines and busses . . . interrupting exciting current of feeder regulators . . . interrupting load currents to rated capacity . . . sectionalizing feeders and distribution circuits.

Specify Engineering Ability. Kearney's staff of engineers is experienced in adapting or combining equipment for complete switching centers or additions to existing units. Designing for unusual needs . . . corrosive or dusty atmospheres, unique space requirements, portable units, or carefully calculating tomorrow's expansion requirements . . . we are geared to handle the unusual.

Kearney Air Interrupter Switches are made in ratings up to 15 K.V.

3E's reliable interrupter is now a Kearney product . . . unmatched for economy and safety

Write for Bulletin 152

KEARNEY

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in highway engineering also engage in other branches of civil engineering. It would be the view of a great majority of firms in private practice that our engineering schools should not sacrifice basic training in engineering science or the humanities to make room for more specialized training in highway engineering. However, I would be willing to see the schools sacrifice almost anything within reason to build into the students two desperately needed virtues:
¶ A more adequate skill in communication, written and oral.
¶ An inextinguishable zeal for more learning of all kinds.

"Newton D. Baker struck at the heart of it when he said 'The man who graduates today and stops learning tomorrow is uneducated the day after." – Mason G. Lockwood in *American Road Builder,* June 1961.

New York Devours Itself

"Demolition of the ornamental architectural plazas, with their sculpture, at both ends of the Manhattan Bridge seems inevitable as part of the reconstruction of the fifty-two-year-old span to provide connections for new expressways on either side of the East River. . .

"Seen from a distance or from the air, the city is like a new natural phenomenon, created not by the tensions of the earth's crust that forces up mountains or by the erosion that modifies their forms, but by the economic circumstances that thrust the skyscrapers into the air and by the problems of human existence that have channeled routes to and through them. The demolition of the two plazas is from this point of view as inevitable and as natural as erosion in nature.

"Thus regarded, the city's constant demolition of itself as part of its springing growth is acceptable; but the fact remains that New York increasingly devours the men who build it, and the city will be one degree further dehumanized

Large cell capacity, economical construction

Inland Celluflor is now available in a brand new profile: Type NF, shown in the above illustration. NF cells are 3 in. deep, spaced three to a panel. NF panels are 24 in. wide, up to 28 ft. 6 in. in length.

Type NF's special advantages are: a large cell capacity for electrification, wide 24 in. coverage, a flat bottom surface which requires less sprayed-on fireproofing, and a design that provides economical spans up to 16 ft. Where full electrification is not required, NF Celluflor may be used in a blend with new Inland Type N Steel Roof Deck for further savings.

Type NF also offers all the advantages of regular Inland Celluflor: fast installation immediately following structural steel, a safe work platform for all trades, and substantial savings in structural steel and footings because of its weight advantage over poured construction.

Your Inland Sales Engineer can give you full information on this important new product. Phone him, or write him in care of our Milwaukee address. Your request will be forwarded to him at once.

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Perforated KEMDOT: Light, dimensionally stable, translucent, impact resistant. Will not rot, mildew, corrode, warp or crack. Non-glare matte finish. Write for samples, technical data. KEMLITE CORPORATION, Joliet, Ill.

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PACIFIC!

For nearly 50 years, Pacific has specialized in big boiler design . . . big boiler construction. Thousands of Pacific boilers have been successfully installed all over the world. With Pacific you get the largest line of low pressure steel heating boilers. The widest experience, too. Pacific men are boiler experts. There's a Pacific representative in your area. Call him for your next boiler.

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Division of Crane Co., Johnstown, Pennsylvania
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CRANE
VALVES AND PIPING • ELECTRONIC CONTROLS
PLUMBING • HEATING • AIR CONDITIONING

when the plazas are gone. The plazas themselves cannot be saved, but the relocation of their architecture and sculpture would be an assertion that our subjugation is not total." — *The New York Times*, Wednesday, June 7, 1961.

Are We Professional Engineers?

"The acquisition of a license to practice professional engineering is generally regarded a thrilling experience to most applicants, who are quite frequently confronted with many unexpected and also frustrating problems. Possession of the license seems to engender an irresistible impulse on the part of many engineers to break away from their employment ties and venture into consulting engineering practice. It is then that they become aware of the difficulties facing the engineer who decides to operate a one-man business, particularly because of the need for a close relationship with someone having customer contact.

"Accordingly, many ambitious licensed engineers are drawn together with various individuals who have the aptitude, sales experience, and finances which are an important adjunct in the development of a successful practice. Often, these individuals seek out the licensed engineer and induce him to enter into a consulting engineering partnership, while in other instances, the engineer takes the initiative by organizing . . . with nonlicensed individuals.

"Experiencing a certain degree of uncertainty, with respect to the legal propriety of such affiliation, the engineer may resort to advice of counsel, whereupon he is in some instances assured that such partnership is entirely legal provided that full responsibility for any engineering work of the organization is assumed by the partner who is licensed to practice engineering. This is an erroneous conclusion.

"As a means of overcoming the problem of conducting a consult-

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IS SOLVING MORE HEAT TRANSFER PROBLEMS THAN EVER BEFORE

New manufacturing techniques and facilities now make available a wider variety of shapes, forms and styles of TRANTER PLATECOIL—applicable to more tank and process heating and cooling and special heat transfer requirements than ever before.

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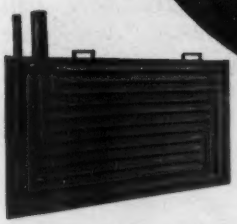

"Standard" Style 90 PLATECOIL with exclusive "MULTI-ZONE" design, for optimum steam distribution. Serpentine styles for cooling also available as standard.

Ask for PLATECOIL® BULLETIN P85.

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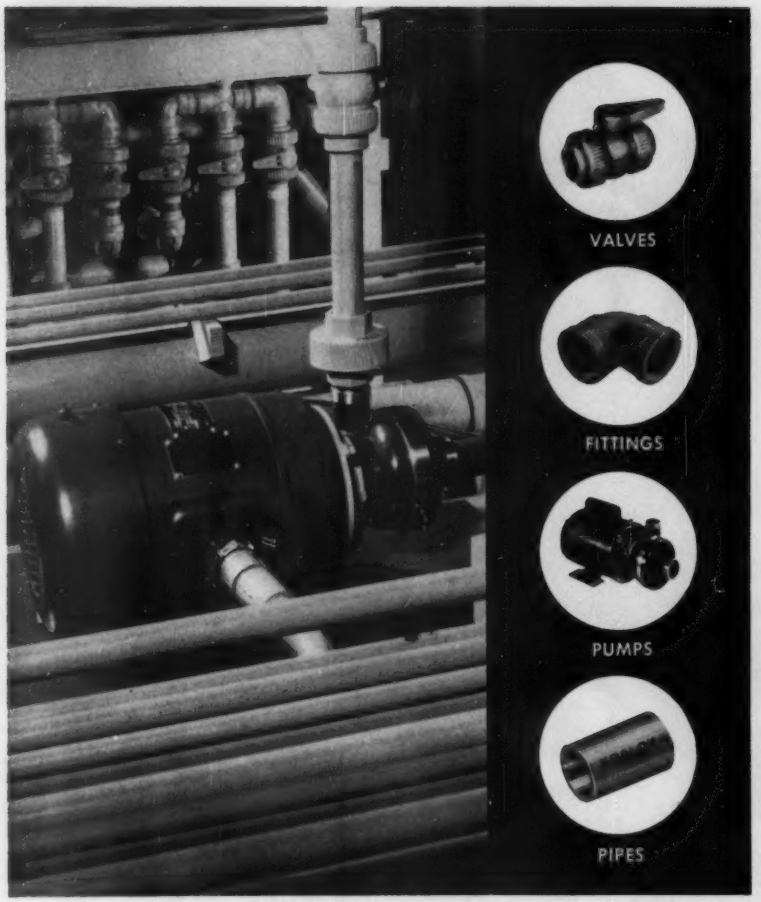

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combats corrosion with plastics

Valves, pipe and fittings, pumps, and electrical raceways are now available to you from one manufacturer. ■ Here is the advantage of plastic piping and electrical conduit systems integrated in design, manufacture and distribution. ■ Corrosion resistance is only one of the many dynamic features of these modern products. ■ Installation costs are reduced . . . fewer replacements are required . . . and the flow rate of liquids is appreciably increased in plastic piping due to the smooth interior walls. ■ From so many viewpoints these plastic products demand your evaluation. Ask the assistance of your Kraloy/Chemtrol industrial or electrical distributor . . . or write
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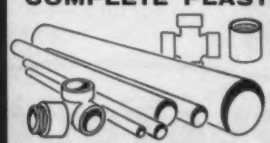
KRALOY PIPING AND ELECTRICAL CONDUIT

CHEMTROL PUMPS, VALVES AND FITTINGS

ing engineering practice by such a 'partnership,' some individuals have been known to enlist the aid of corporations, organized prior to April 15, 1935, who were duly registered by the State Education Department to practice engineering. They are known to have offered a substantial sum to purchase such corporations, and if successful, they change the name and feel 'safe' as long as their chief executive officer is a licensed professional engineer. Obviously they are providing their own broad interpretation with the aid of legal counsel, of Article 145, Section 7209, of the State Education Law referring to corporate practice. Although this section does permit the purchase of an existing corporation duly licensed to practice professional engineering whereby such license is required due to provisions of 'Federal Law,' it is extremely doubtful whether there was an intent to apply this Section to circumstances permitting unauthorized practitioners to seek immunity through the medium of a 'Corporate Veil.' " — Raymond Mirrer, P. E., L. L. B., Member of Kings County Chapter, NYSSPE, in *The Registration Bulletin*, June 1961.

Engineering and Education

"Engineering is a profession. Its members do creative work which results in things that people need or want. These things may be highways, submarines, interplanetary vehicles, antibiotics, or television. Science, on the other hand, is a search for knowledge. The science of mathematics extends abstract knowledge. The science of physics extends organized knowledge of the physical world. In each of these, consideration can be limited to a carefully isolated aspect of reality. . .

"Engineering education is being urgently called upon to produce graduates well versed in rapidly advancing science, who will lead industry and the public into the

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QUARTZ-beam® FLOODLIGHT

Designed to maintain operating position and thermal level essential for proper self-cleaning of iodine-cycle lamps, QUARTZ-beam QFL-15 projects per-unit-area maximum of lamp's 33,000 lumen output. Provides constant unfading output of clean, white light, with candlepowers up to 200,000, and an average lamp life of 2,000 hours.

Three beam spreads available, with minimum vertical angle as narrow as 13°. Reflector is one piece die-formed, polished or etched. Cast aluminum door and housing sealed by silicone rubber gasket. Heat and impact resisting lens. Door locks tightly and releases quickly by means of 4 wing-nut clamps.

External raintight fuseholder (with fuse). Aiming and leveling device, exterior focusing screws included. Trunnion or slip fitter mounting. Hood, louvers and special mounting bases available. Get further information from your Crouse-Hinds distributor.

concentrates in sharp rectangular patterns the high-lumen output of 1500 watt Quartz-Iodine lamps
Type QFL-15 1500 W.
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Type QFL-8 500 W.
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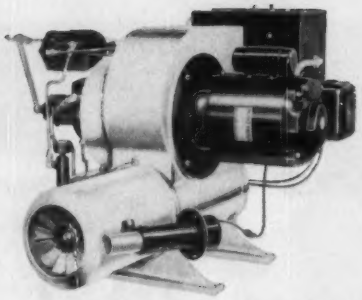
HEV-E-OIL BURNER
saves fuel & operating costs

Especially engineered to make use of inexpensive No. 4, 5 and 6 heavy oils. Only burner to apply successfully the principle of low pressure air atomization of heavy fuel oils *inside the burner nozzle*. Eliminates costly maintenance.

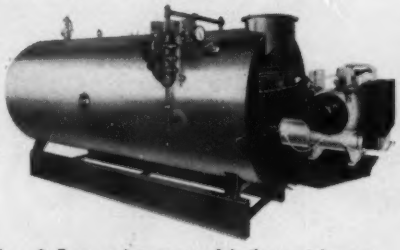
Write Dept. B-81 for nation-wide listing of HEV-E-OIL Burner installations.



- Ready to install — factory assembled — completely wired.
- All combustion air is furnished by the burner.
- Simple installation saves money.
- Factory trained service men available throughout the country.

HIGHLANDER AUTOMATIC BOILER-BURNER
low or high pressure steam or hot water

You can rely on this HIGHLANDER for *all* heating or power applications. Choice of burners for heavy oil, light oil or combinations of gas/light or gas/heavy oils.



- Easy maintenance of boiler and burner.
- Burner fire tested at factory.
- Entire unit Underwriters Laboratory Approved — Certified rating for output.

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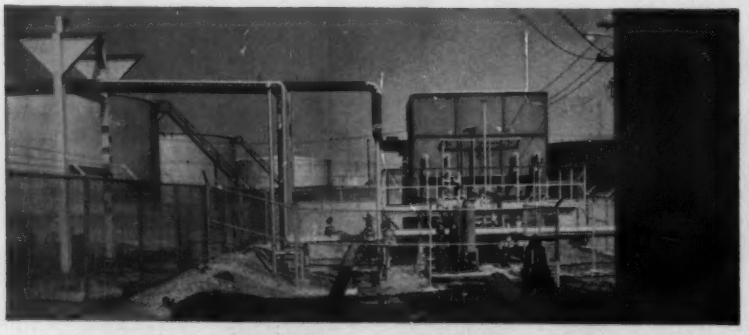

SAVE POWER AND WATER WITH THIS AIR COOLED CONDENSER

NIAGARA *AERO* VAPOR CONDENSERS give sustained full capacity in condensing vapors by evaporative cooling with only nominal use of water. You have no problem of water availability, or disposal, or quality, or temperature.

The system is self-contained... no cooling tower or spray pond is required. You save not only the cost of condensing water but also the expenses of piping and pumping, and the cost of water handling equipment.

In the Niagara Vapor Condenser the heat is removed at the rate of input and the cooling effect, directly proportional to the load, is controlled by varying the amount of air passing over the cooling surfaces. Operation is automatic and trustworthy.

Liquids and vapors are always held at constant temperature under close control. You get uniform distillation products the year round. You get better quality and increased production.

Non-condensibles are effectively separated and sub-cooled, giving you better vacuum pump operation. You save power and steam.

Niagara *Aero* Vapor Condensers are manufactured in standard units in a range of capacities up to thirty million BTU's. Write for full information; ask for Bulletin 139-R.

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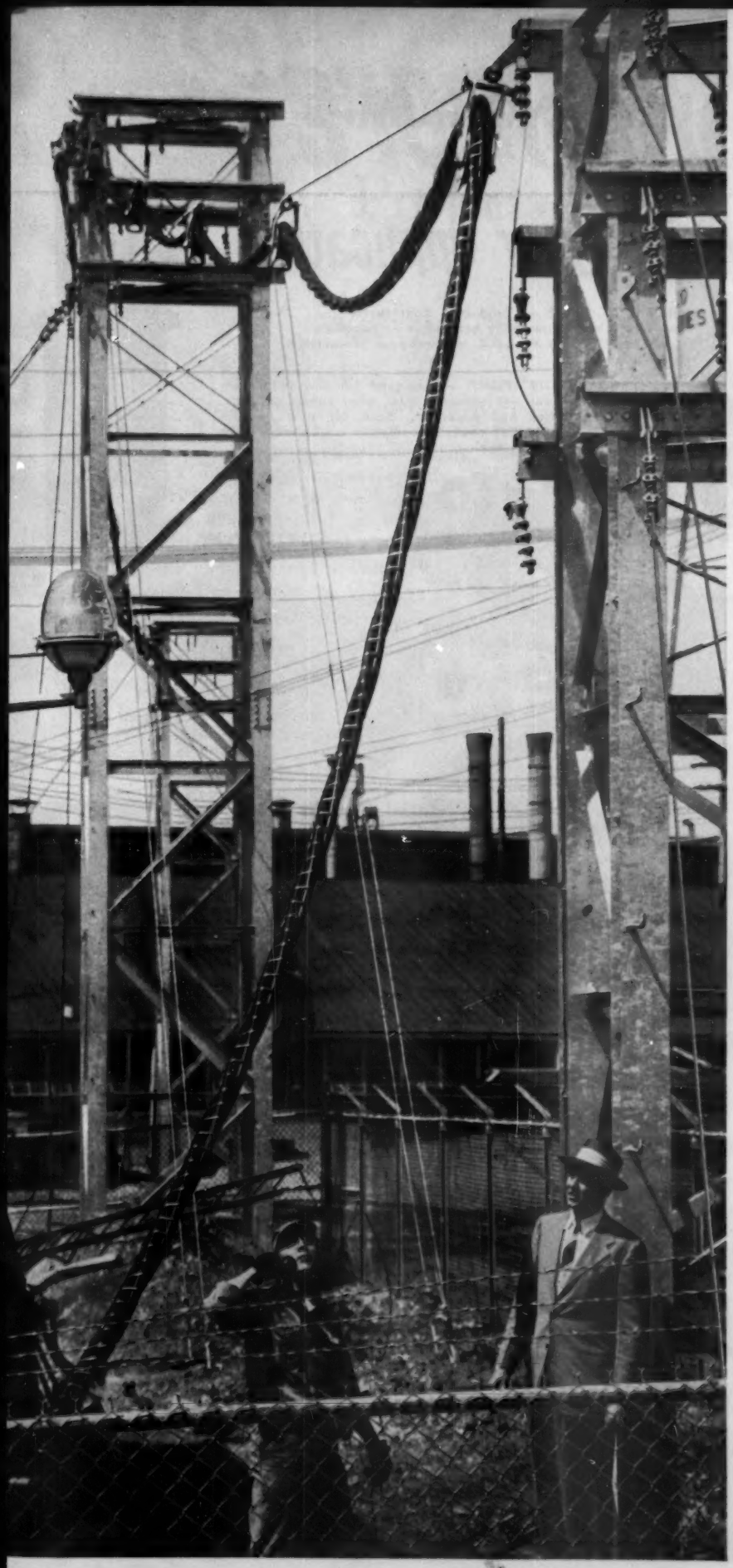
Niagara District Engineers in Principal Cities of U.S. and Canada

new world which engineering will make possible. Engineers will often discover in science, through their own research and invention or through the findings of scientists, those things which can be put to human use. In any engineering achievement, however, the thing produced is the objective, and all means available to the intellect of man will be employed to reach that objective. Science and its application remain a part, but only a part, of any great engineering advance. Supersonic aircraft could have been devised and made only by engineers with great resources in science. In order to make the first supersonic airplane, however, science had to be combined with the engineer's drive toward creation of a predetermined object. Young people who can respond to this kind of challenge are needed now, but they will be needed as never before in the years ahead." — A statement prepared by a committee of the school of engineering, Massachusetts Institute of Technology, as published in the *Journal of Engineering Education*.

A Matter of Perspective

"If sending a man to the moon and bringing him back were entirely a scientific affair, then, as one suggestion has it, we ought to send a midget. Not only would the midget himself constitute a much smaller payload, but his requirements for food, oxygen, shielding from harmful radiation, and disposal of body wastes would be comparably reduced in scale.

"Our present astronauts, it is true, do have the benefit of military training and discipline. But midgets who have had professional experience in circuses and carnivals will have absorbed the equally demanding traditions of show business. As for intelligence, Barnum's famous Tom Thumb was so bright that at the age of five he could be convincingly billed as an eleven-year-old." — *Science*, June 16, 1961. ▲▲



GO UP TO BRING COSTS DOWN WITH ANACONDA AERIAL CABLE

Anaconda's compact, self-supporting factory pre-assembled aerial cable is installed as a *single unit*. No field assembly is required—and no lashing operation. In plants where the maze of pipes and other underground structures often make installation of ducts or buried cable costly or difficult, this cable solves the problem.

It's fast, easy to install—particularly in crowded areas. You need only one assembly even for three-phase circuits. No special ducts, crossarms, or insulators are required.

Your clients can attach Anaconda aerial cable directly to a pole or building-attached bracket.

Type AB butyl insulation and Neoprene jacket affords resistance to moisture and heat. For the full story, call the Man from Anaconda today. Or write: Anaconda Wire & Cable Company, 25 Broadway, New York 4, New York; Department EFL-1-CE. 61262-CE

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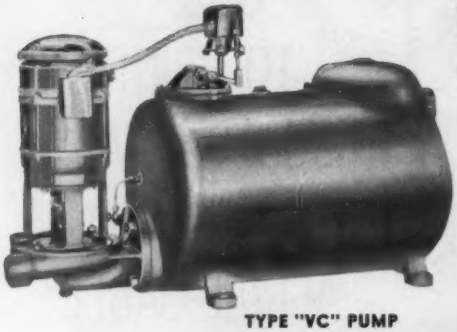
Specify Skidmore HEATING PUMPS

One is just right for your application



TYPE "VC" PUMP

TYPE "VC" PUMP — cast iron construction . . . low inlet connection easily accessible — capacities, 1,000 to 65,000 sq. ft. E.D.R. — discharge pressures from 10 to 75 lbs.

TYPE "UV" PUMP — designed for low return installations — featuring new wide range of sizes, capacities and pressures. Send for new bulletin No. 19-B which contains complete engineering data and capacity table.

TYPE "UV" PUMP

SKIDMORE VACUUM PUMP—SINGLE UNIT
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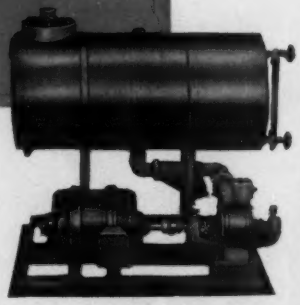
MAINTAINED EFFICIENCY . . . automatically adjusts itself to the varying conditions.

Low return lines . . . reduces installation cost, often eliminating the necessity of a pit.

Capacity remains constant year after year . . . eliminates adjustments and costly repairs.

TYPE "H5" PUMP

Sturdily constructed for dependable service at small investment —capacities, 1,000 to 65,000 sq. ft. E.D.R. discharge pressures from 10 to 75 lbs.



TYPE "TM" PUMP

Completely assembled on either steel or cast iron base — capacities, for boilers up to 250 H.P. discharge pressures to 150 lbs.

Send for bulletins on all Skidmore Pumps

TYPE "CCVS" PUMP — features close-coupled design and mechanical shaft-seal. Single unit is built with 5, 10 and 20 gallon receivers. Send for new bulletin No. 21-C which fully describes both single and duplex units.

SKIDMORE PUMPS

SKIDMORE CORPORATION ST. JOSEPH, MICHIGAN

The New Projects

France, England Combine Power

In early June, the final stage of a project linking the electric grids of England and France was begun with the laying of 15-mile twin cable from Dungeness, England, to Colbart Ridge, mid-point in the English Channel. The section to be supplied by France is already in place. The completed link will be 38 miles long. Converter stations will be placed at Lydd (Kent) England, and Echingen, France. The stations will convert power from ac to dc for under-channel transmission at 200,000 v, 800 amp.

Feasibility of this arrangement is based on the fact that peak demands in these countries occur at different times. Capital cost, equally divided, is $12.5 million, which is economical when compared to equivalent individual peak power generation outlays that would cost each country $20 million apiece. Individual annual savings to the participants is expected to be $750,000.

New York Air Terminal Building

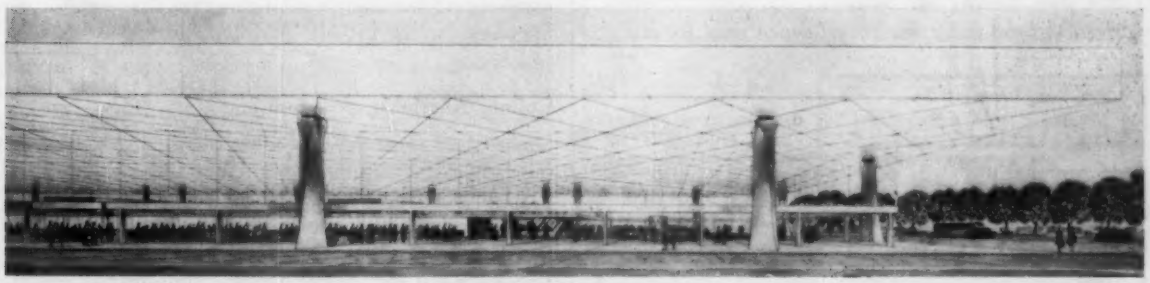
The Port of New York Authority has selected a space frame design by I. M. Pei & Associates, New York City, for its new multiairline terminal building. The building, to be constructed in the $150 million Terminal City development at New York International Airport, is a block-long rectangular structure with two-story-high glass walls on all four sides. A flat, cantilevered space frame roof of preassembled steel pipe tetrahedrons will be supported on free standing concrete pylons outside the walls of the building. A concrete deck will form the roof surface. Construction is scheduled to begin in early 1962.

Nervi's Largest Building

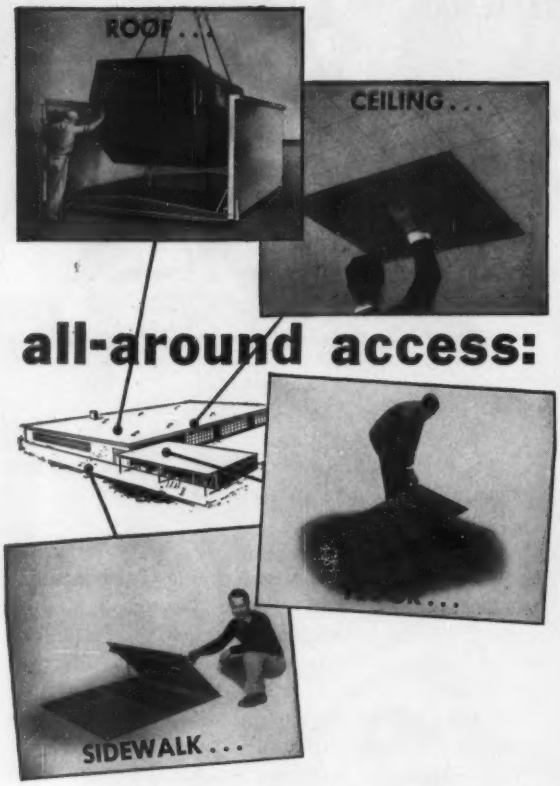
The Palazzo del Lavoro, a simple Parthenon-like structure executed in reinforced concrete, is a competition winner in classical style architecture, and also is a monument to Italy's unification after the Risorgimento. Located in industrial Turin, this new Nervi-designed structure encloses 580,000 square feet of floor space. The structural design features 16, 75-ft high, cruciform tapering concrete columns, each of which supports a 125-ft square concrete roof slab on steel ribs projecting from the top of the column. The column "umbrellas" are free standing, and the two mezzanine floors above the ground floor have 45-ft square apertures through which these columns pass. The structure, which is to be used for exhibitions and educational purposes, is to be completed in a period of 17 months.

St. Louis Climatron

Ten different tropical climates coexist in the open area below the dome of the Missouri Botanical Garden Climatron, St. Louis, which recently was awarded the $25,000 R. S. Reynolds Memorial Award. Murphy and Mackey, architects, St. Louis, created the



Artist's rendering of the exterior of new multiairline terminal, designed by I. M. Pei for the Port of New York Authority.



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Ease of installation, permanent weather-sealing, and rugged construction are all part of the Bilco quality tradition. Exclusive design features include built-in spring operators for effortless lifting of even heavy plate doors. Bilco all-metal doors give you freedom of design, too—they fit and blend with any structure.

Specify Bilco doors...design with Bilco doors in mind...with confidence in Bilco lifetime quality.

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HORIZONTAL SPRING-OPERATED DOORS

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Please send me your new catalog on special service doors.
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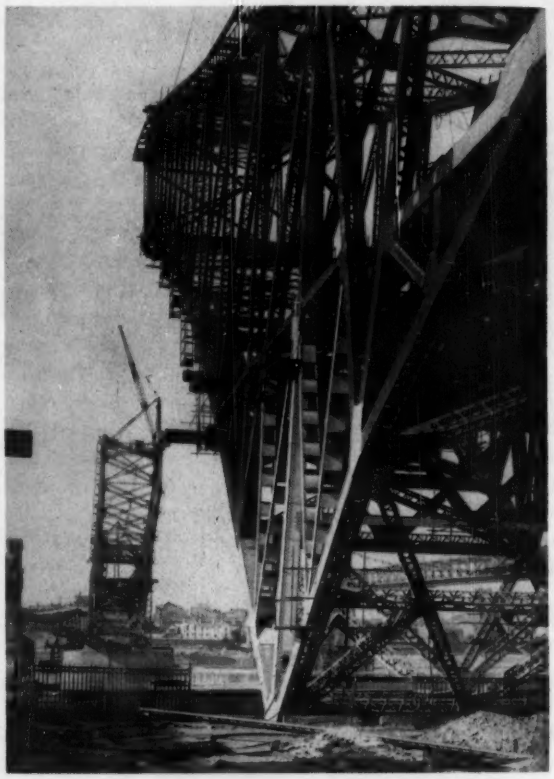
CITY ZONE STATE

175- ft diameter aluminum and plastic geodesic dome structure, and Fred S. Dubin Associates designed the mechanical and electrical sections. This is the first time that an American design team has been the recipient of the Reynolds award.

Runcorn-Widnes Bridge

Built to replace a 60 year old transport bridge over the Mersey River, the new Runcorn-Widnes arch



New Runcorn-Widnes bridge to be Europe's longest arch.

bridge will be the longest arch span in Europe – the third longest in the world. Some 5600 tons of steel are in the main bridge span of the $9 million project, expected to be completed this year. The consulting engineer for the project is Mott, Hay and Anderson, of London.

County Administration Building

Santa Clara County, California, boasts a new $3 million, eight-story administration building designed by a group of area architects and engineers. Several years ago, a group known as the Associated Architects of Santa Clara County got the green light to develop plans for an integrated administration center for the (then) widely scattered county government

How You Can Eliminate Fluorescent Ballast Noise Problems in Your Buildings

Today's trend toward higher levels of illumination—increasing the number of fixtures, lamps, and ballasts, or increasing the wattage of the lamp/ballast systems—makes fluorescent ballast sound a more and more important building consideration.

General Electric wants you to take full advantage of modern lighting levels. At the same time, you should assure yourself that you can solve any audible ballast "hum" problems in your lighting installation with minimum attention and effort.

ALL YOU HAVE TO DO IS . . .

1. Check each lighting installation *while it is still on the drawing board* with the General Electric Sound Rating Calculator* (see below) to predetermine whether ballast noise will be a problem, and . . .
2. Specify the appropriate *General Electric* sound-rated ballasts for the installation.

That's it. By properly following this two-step procedure, you can predict and overcome potential ballast noise problems before they exist.

General Electric, with five years of highly successful experience in the G-E Ballast Sound-control Program, is confident that this procedure will solve your ballast noise problems. Here's how the program works . . .

THE GENERAL ELECTRIC BALLAST SOUND RATING CALCULATOR is based on data gathered from hundreds of lighting installations over a period of many years. It provides a reliable index of the magnitude of audible ballast sound when room variables such as size, ceiling materials, and number of fixtures and ballasts are known. These calculations are keyed to . . .

GENERAL ELECTRIC'S BALLAST SOUND RATING SYSTEM. This system, initiated by General Electric in 1951, establishes a rigid scale of sound magnitude. Most General Electric ballast designs are carefully compared with this scale in actual fixture tests conducted in the only known anechoic sound chamber in the ballast industry. Each ballast design is thus "Sound-rated" "A" through "F," . . . "A" being quietest, and "F" being least quiet.

The sound-rating scale—and for that matter, the whole sound-control program—is not an industry standard. General Electric has established its own sound standards, and compares the performance of *General Electric ballasts* with these standards.

But the Sound-control Program doesn't end here. In order to give you further assurance that you get the "quiet" you specified, General Electric has established an elaborate . . .

DAILY PRODUCTION SOUND AUDIT. A *daily* sample of production units is carefully compared in sound performance with the G-E sound-rating standard—under controlled conditions in the anechoic sound chamber. This close check on possible manufacturing variations means you get the kind of sound performance that your Sound Rating Calculator promised. The final element in G.E.'s Sound-control Program is . . .

BASIC ENGINEERING DESIGN. General Electric ballast design engineers are constantly examining today's ballast circuitry, trying to further minimize the inherent magnetic "hum" of core and coil assemblies. An example of the results of this engineering effort is the recently announced "A" sound-rated 40-watt, rapid-start line. This popular family of General Electric ballasts was granted a G-E "A" sound rating as a result of *basic circuit design* that produced a smaller and quieter core and coil.

Materials are also an important sound-control factor. For example, the resilient asphaltic filling compound used in General Electric ballasts maintains excellent sound-absorbing characteristics over the entire life of the product. The new General Electric Bonus Line† ballasts, using this proved asphaltic filling compound, are designed to provide protection against objectionable ballast end-of-life leaking and smoking, without sacrificing any sound performance.

All this means that General Electric is truly concerned about ballast sound—and is investing heavily so you can stop being concerned with it yourself. Mail the coupon today for your General Electric Sound Rating Calculator, and start using it immediately. For more details, ask your local General Electric Ballast Sales Engineer, or write Section 403-02, General Electric Company, Schenectady 5, New York.

† Trade-mark of General Electric Company.

GENERAL ELECTRIC SOUND RATING CALCULATOR

This ingenious device was designed so you can always predict *with 100% accuracy* whether a lighting installation will present noise problems. You can use it for any indoor lighting application from extra-quiet broadcast studios to noisy offices. On the easy-to-use circular slide rule you simply (1) dial in room "constant," (ability of room to absorb noise); (2) number of ballasts and their sound rating and (3) given ambient noise level for your application. Steps 1 and 3 are *immediately determined* from tables which are part of calculator.

PLEASE SEND ME THE FREE BALLAST SOUND RATING CALCULATOR

Mail coupon to: General Electric Co.,
Section A403-02, Schenectady 5, N. Y.

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COMPANY_____

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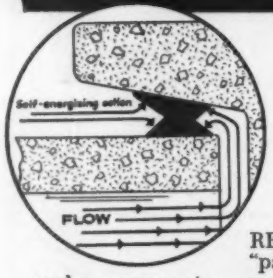
Self-Energizing REXON "K" GASKETS



✓ PREVENT LEAKS

✓ SPEED PIPE-LAYING

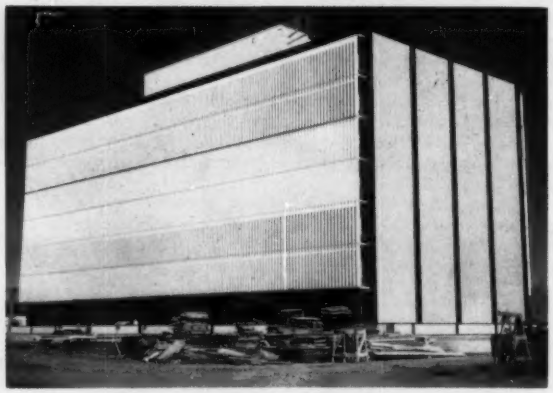
REXON "K" *Rubber* Gaskets "pack" the pipe joint tight under compression, preventing leakage in or out of the pipe joint. Self-energizing action causes Gasket to seal even tighter as water pressure increases. Made for standard bell and spigot concrete pipe, REXON "K" Gaskets "snap-on" to the pipe, and the pipe is quickly coupled into the line. Wet trenches do not delay the work. Made of acid-resistant rubber, they never deteriorate. REXON No. 2 PIPE COATING protects concrete pipe against deterioration by hydrogen sulphide gas, oils, greases and solvents. It is synthetic hard rubber which vulcanizes to pipe by catalytic action, *not* by evaporation which causes pin-holes. WRITE FOR MORE DETAILS. 5104

HAMILTON KENT MANUFACTURING CO.
Kent, Ohio *ORchard 3-9555*

department branches. To facilitate mechanical engineering design, consulting engineers Francis E. Adams and M. J. March, San Jose, formed a joint venture for mechanical design of the project.

Subsequently, the architects set up a special office near the mechanical engineer's office, and Robert E. Jones, structural engineer, assigned a man to the office. George Ninnis, electrical engineer, and the other design principals then had a convenient meeting place to confer as the project progressed.

The building reflects the harmonious planning efforts of the engineering and architectural design



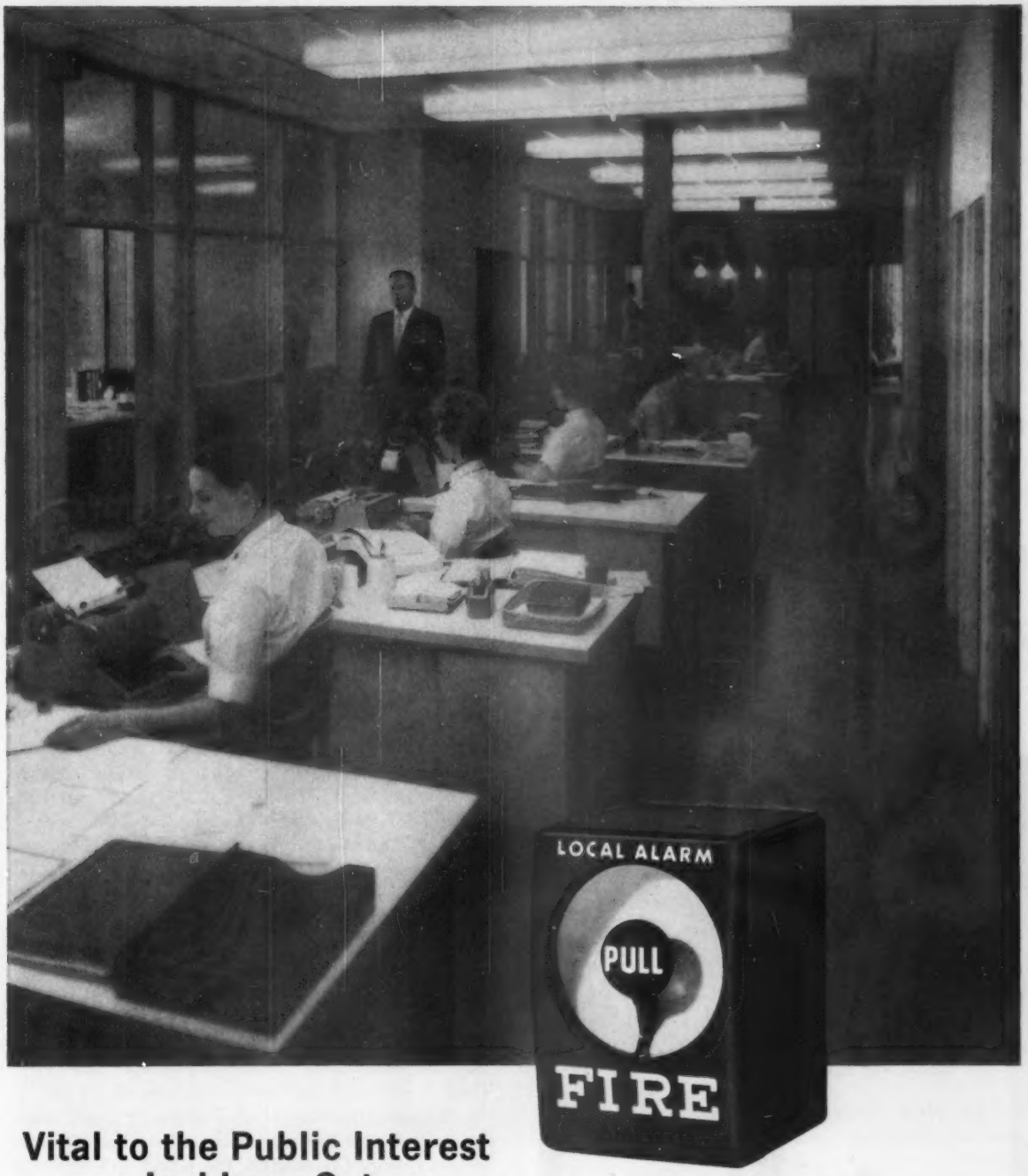
A joint design venture—new Santa Clara County Building.

team. Design innovations for the area include: movable vertical sunshade louvers on the east and west walls of the building; special double deck penthouse quarters for the high velocity heating and air conditioning; electronic air supply filtering; acoustical treatment of ducts and zone mixing boxes; special air conditioning for an electronic data processing center in the building; and provision for temperature and humidity control in underground record storage. Custom electrical louver controls and equipment failure alarm systems are also incorporated.

The reinforced concrete structure has 40 percent glass in its east and west walls. Special heat/glare reducing glass was used on the first floor. The external louvers are reported to have saved the taxpayers some $80,000 in costs, prorated over a 20-year period. An unusual but logical factor in construction was the specification that the mechanical contractor retain an independent registered mechanical engineer to check out his work. The general contractor was Kleine and Company, San Jose, California.

Column Stretching a Challenge

The installation of two high speed elevators in a 12-story Philadelphia building required a caisson to be shortened 7 feet, and a column bearing 2½ million



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Gamewell FLEXALARM *interior* fire alarm signal systems offer the same high standards of reliability. They can be planned as part of complete fire protection for *any* building: institutional, commercial or industrial — public or private.

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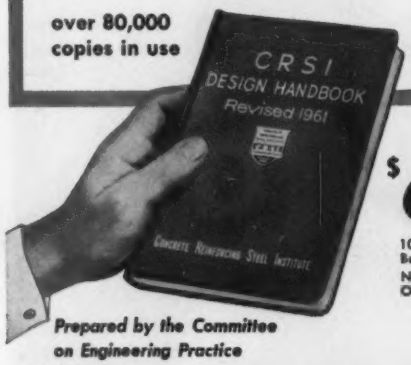

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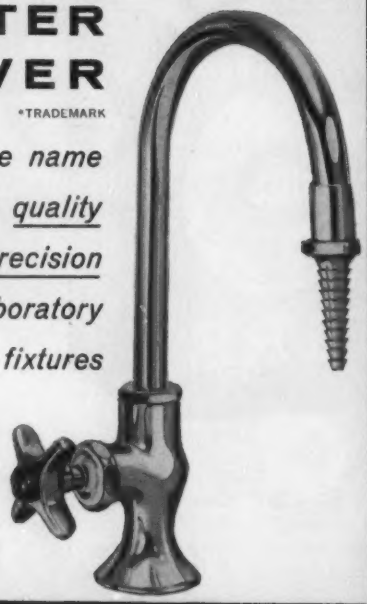

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WATER SAVER FAUCET CO.
611 WEST ADAMS ST., DEPT. CE, CHICAGO 6, ILL.

pounds to be lengthened accordingly. The problem of disturbing the column was compounded by the fact that a 6½-in. thick base plate measuring 4'-0" by 4'-4" was carried on a 5-ft diameter caisson — leaving no working room.

Walter H. Wheeler, Minneapolis consultant, solved the problem by reducing column loading to 830 tons by removing live building loads. Holes were then cut in the base plate and caisson, and four temporary steel columns were inserted. A heavy reinforcing ring of concrete was placed around the caisson where the temporary columns were supported.

Next, fireproofing was stripped off the bottom of the column, and heavy wing plates were welded to web and flange surfaces. A grillage of heavy steel beams was erected over the top of temporary columns, and hydraulic jacks were placed between wing plates and grillage to lift the column. Beam sections and shims were used to prevent slippage.

When the above construction was finished, the caisson was cut off, ground flat, and the base plate moved down. The new column extension was slipped in by jacking up the column slightly. It was then welded to the old column and base plate. Cut out portions of the base plate were welded back in place, and the equipment used for temporary support and jacking was removed.

Automated Bakery

An automated bakery, equipped for continuous production of a nationally distributed product has recently been completed for a Chicago, Illinois firm. The production kitchens occupy 140,000 square feet and feature such innovations as pneumatic conveyance of materials from freight cars, automatic batching, mixing, weighing, and assembly line retarder cooling, cutting, proofing, baking, cooling, icing, packaging, and freezing. A. Epstein and Sons, Inc., Chicago engineer-architect, was the designer.

Pakistan Nuclear Power Study

Gibbs & Hill, Inc., consulting engineers, New York City, is cooperating with Internuclear Company, Clayton, Missouri, in the preparation of an initial report on the feasibility of nuclear power applications in east and west Pakistan. Prepared for the Pakistan Atomic Energy Commission, the report will compare costs of power generation by nuclear methods with conventional power generation costs.

African Office Building

The 23-story Livingstone House, Salisbury, Rhodesia, is reported to be the tallest office building in the Central African Federation. Designed by Kass Chatterton and Partners, consulting engineers, the structure was built by Richard Costain (Africa) Ltd. for London County Properties of Rhodesia. ▲▲

There's no waste with a PYREX® drainline

No installation waste. The new one-nut joint on PYREX® "double-tough" drainline speeds installation, saves dollars and days.

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If you want more reasons for specifying PYREX drainline, we've got a bulletinful. Write for a copy of PE-30. Plant Equipment Department, 2408 Crystal Street, Corning, N. Y.

see our catalog in Sweet's (S)

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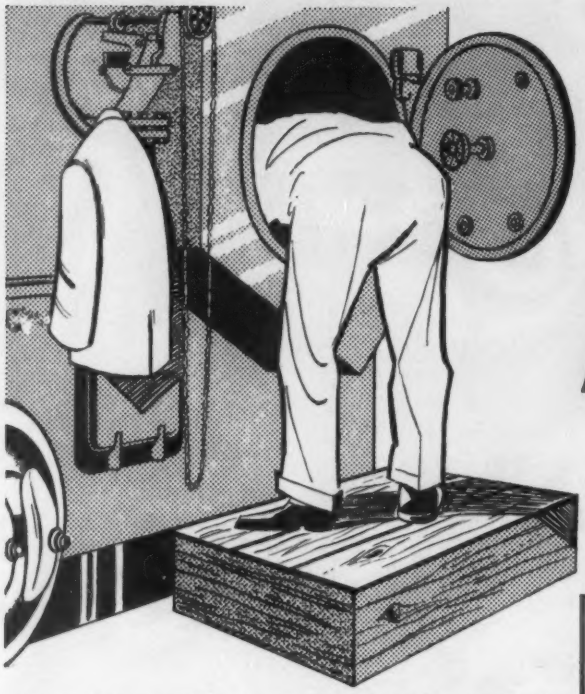
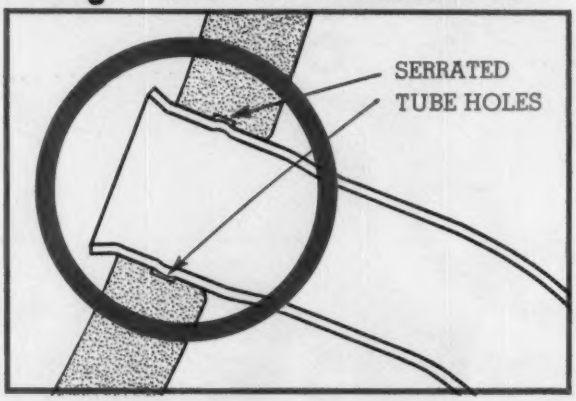


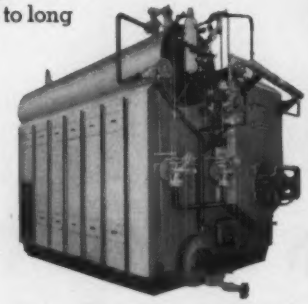
You'd have to CRAWL INTO THE BOILER to see these features which make SUPERIOR "TYPE D" *Completely Packaged Boiler* longer-lived and trouble-free

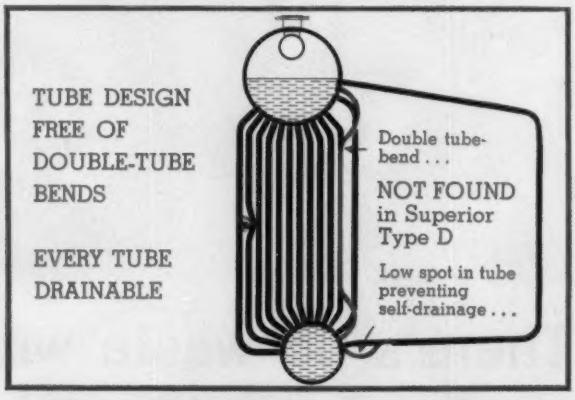
Even if you crawl in, you won't see the serrated tube-holes which provide protection from tube leakage and its resultant caustic embrittlement . . . yet, as you would expect in a quality boiler, they are part of the Type D Superior Packaged Boiler.

Another hidden quality feature is its tube design, shown at right. Note that there are no double tube-bends (shown in red) exposed to radiant heat . . . a characteristic of many water-tube boilers which increases susceptibility to scale formation. Note that every tube is self-drainable (eliminating need of separate blowing operation in cleaning). All tubes provide maximum vertical length with minimum number of bends.



Not all features of Superior's Type D which contribute to long life and trouble-free performance are obvious from the exterior. Some are buried deep inside the boiler . . . but they are there to assure you of the performance you have come to expect from Superior Packaged Boilers.





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Parallel Reading for Consulting Engineers

Kings in the Kitchen, edited by Gertrude Booth; A. S. Barnes and Co., Inc., New York, N.Y.; $5.00.

As a minority group, men have campaigned long and unsuccessfully for recognition as equals in the kitchen. Despite evidence that the very best cooks all are men, women — solely on the basis of quantity — are regarded as the food preparers of the world.

But now, armed with *Kings in the Kitchen,* we may be able to claim our rightful place. This is a cookbook, an extraordinary cookbook. It contains the favorite recipes of over a hundred well known MEN. The author has collected these recipes from famous men who like to putter around the kitchen. Not only are we fortified by this proof that important men manage to be important in their own kitchens, we are gratified in the knowledge that all these recipes were collected by a woman. It may be the beginning of some mutual understanding.

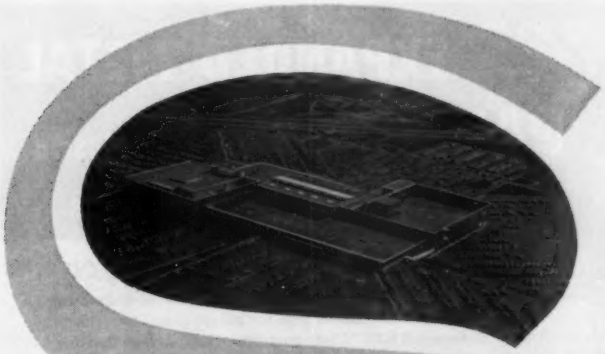
The next time we are shooed into the living room by an otherwise friendly wife, we will point out that Jackie lets the President make waffles and that Mrs. Disney wouldn't think of interferring with Walt's chili and beans. We may even allude gently to Lawrence Spivak's brownies.

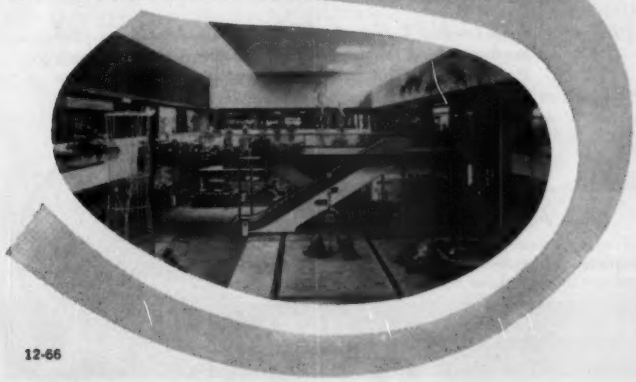
•

Water Purity, A Study in Legal Control of Wisconsin Resources, by Earl Finbar Murphy; University of Wisconsin Press, Madison, Wisconsin; $4.75.

This interesting and well-documented account of the development of water pollution control is well suited to the times.

The efforts of Betham in England and Frank in Europe are cited, along with their theoretical solutions to the pollution problems caused by promiscuous industrialization of what were primarily agricultural countries. Transferring the problem to America, the author carefully develops the pattern of industrial plunder of the rich new country, and the subse-





In the world's largest single-structure shopping center, the 84-acre Southdale Center in Minneapolis, you'll find ALTEC Engineered Sound Systems. You'll find ALTEC Systems too in Detroit's ultra-modern Ford Memorial Auditorium; in the International Amphitheater in Chicago; in schools, stadiums, churches; in government, commercial and industrial buildings all over the world.

That's because ALTEC sound systems, like all ALTEC products, are designed for dependable service under all conditions, for long life, and for ease of installation and service.

There are more than 100 different ALTEC commercial sound components and/or systems

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available for designs to meet your specifications. Before you specify commercial sound equipment, you'll want to talk to your nearest ALTEC representative. For his address look in the Yellow Pages of your Telephone Directory or write to ALTEC at the address below.

See Altec's product listing in Sweet's Catalog Architectural File (17f/AL), 1961 Edition.

**Victor Gruen and Associates, Los Angeles*

ALTEC

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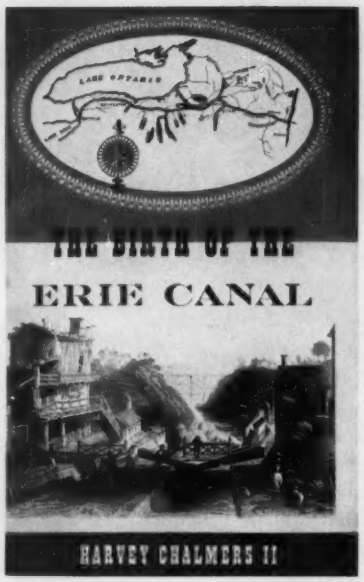
quent efforts to awaken the public conscience to the problems of restoring our resources.

Wisconsin, the specimen state in the book, is an ideal example of an American state rich in only a few resources which, in its eagerness for industrial development, sacrificed priceless timber, water, and agricultural wealth.

This book is not light reading. It exposes the sorry attitude of an indifferent public and reveals industry's approach to pollution — something less than the serious concern we have a right to expect.

•

The Birth of the Erie Canal, by Harvey Chalmers II; Bookman Associates, New York, N.Y.: $3.50.



If you are looking for engineering history, this is not the place to find it. Chalmers has larded a solid center of fact with a generous layer of fiction to tell of the dreaming and politicking behind one of America's great engineering achievements. It is probably fair to say that the Erie Canal was engineered in the New York State legislature and that it was finally built, not because anyone was really sure that it could be done, but because it seemed to be the only way to keep central and western New York from falling under the economic control of the Canadians. At a time when Canada is squirming under the economic domination of the United States, it is interesting to look back a bit and realize that in 1800 the roles were reversed.

We cannot vouch for Chalmers' characterizations, but *The Birth of the Erie Canal* gives a new slant on such personalities as Gouverneur Morris, Thomas Eddy, DeWitt Clinton, Judge Jonas Platt, and Philip Schuyler. As a matter of fact, the story of the Erie Canal is not complete unless we also include the names of Washington and Jefferson. In linking all of these people together, Chalmers does a masterful job of building up to the fateful day of March 19, 1817, when the Canal Law was finally passed

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through the New York legislature. There have been many exciting moments in both state and Federal legislatures, but few can match the dramatic heights of the moment when the Erie Canal was written into the law of the State of New York.

Today the Erie Canal is just a memory, but in 1886, it was a fantastic network which tied the State of New York together from Troy on the east to Buffalo on the west. It was the economic lifeline that gave the Empire State its name.

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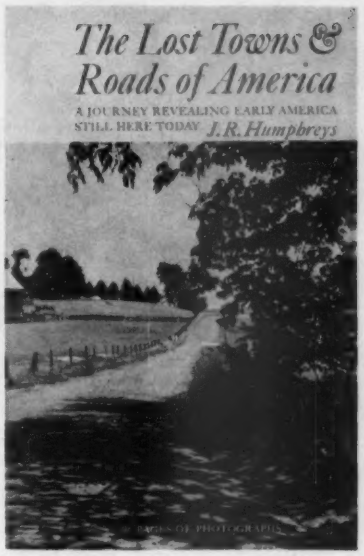
The Lost Towns and Roads of America, by J. R. Humphreys; Doubleday & Company, Inc., Garden City, N.Y.; $4.95.



If you are one of those who wonders where the little roads go, as you roll swiftly down the freeway, this is the book for you. It took Humphreys and his wife 45 days to travel from the New Jersey Atlantic Coast to the California Pacific Coast. They did it on the "little roads," spending their nights in a Volkswagen camper on the edge of quiet old town squares or on the sites of long forgotten ferry landings – as well as on the open mountain and desert country of the West. Their stopping points were such places as Lancaster, Gettysburg, New Harmony, Shawneetown, Tama, Medicine Lodge, Taos, Durango, Tonopah, and Salinas. Some of these are still recognizable in the present, but most of them send the pages of the mind leafing backwards.

There is nothing wrong with the freeways and tollroads – if you are going somewhere. But there is a great deal of United States history to be learned simply by driving on the back roads. We still have our colonial villages, our hillbilly shanties, our farmyard graves, our general stores, and our town pumps. And there are still a few covered bridges and paddlewheel river boats. It is not Humphreys' purpose to belittle progress, but he does make it very clear that our American heritage is not so much a thing of the past as a thing which we too often simply pass by. ▲▲

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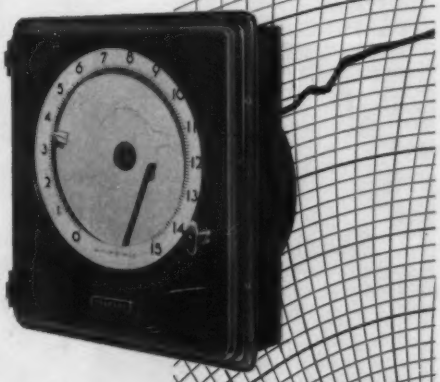

Recording, indicating and totalizing meter for measuring sewage or other flows over Parshall flumes and weirs. This instrument has interchangeable flow cams and flow conversion gears . . . an important factor to consider for sewage treatment plants in rapidly growing communities. With a simple change of cams and gears the Type B-FT Recorder can operate with a different size flume or accommodate a greater range of flow than that for which it was originally purchased. The change does not require factory service. Similarly, change from weekly to daily time scale, or vice versa, is accomplished by merely repositioning one gear — no new parts to buy.

This recorder can be direct float operated or remotely controlled and is available for wall or switchboard mounting, or with cabinet for mounting out of doors directly over the float well. Request BULLETIN 25 for complete details.

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Complete specification data sheets on request Section A pages 9-10 9a-10a

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Men and Firms

George L. Sodemann, of Sodemann and Associates, Champaign, Illinois, has been elected president of the Illinois Association of Consulting Engineers. Other new officers are: Richard L. Thacker, vice president; Robert Hofmann, secretary; Robert E. Hamilton, treasurer; George J. Chlebicki and Charles W. Greengard, directors; and J. R. Gardner, delegate, and W. J. Campbell, alternate delegate to Consulting Engineers Council.

SODEMAN

SHEEHAN

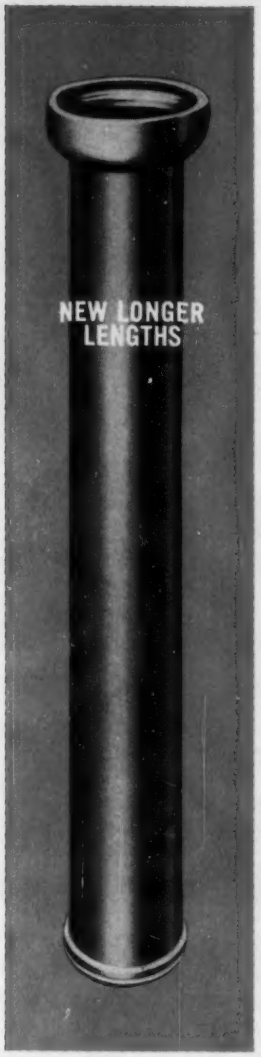
William Francis Sheehan, partner in the Buffalo, New York consulting firm of Sheehan, Schweizer and Associates, has been appointed to the Erie County (New York) Economic Development Group. Sheehan is one of 80 business, industry, and labor leaders chosen to advise county officials on measures to promote the economic growth and development of the Western New York area.

John P. McCloskey has been named to a new post of manager of sales for the Pittsburgh office of The Rust Engineering Company.

Marsden C. Smith, recently retired Chief Engineer, Department of Public Utilities, Richmond, Virginia, has become a consultant to Whitman, Requardt and Associates, Engineers, Baltimore, Maryland. Smith designed and supervised most of the water supply improvements in the Richmond system and is well known for his work in water treatment.

H. E. Bovay, Jr., Consulting Engineers, Houston, Texas, announce the following personnel changes: L. S. Curtis has become manager of the firm's Baton Rouge office. Replacing Curtis as manager of the Richland, Washington, office is George C. Love, formerly chief engineer at Richland. A. H. Kintz, formerly senior mechanical engineer, is the new chief engineer, in Richland. C. E. Craig, Jr., in charge of chemical plant design, Spokane, Washington, will return to Baton Rouge this fall to manage the mechanical department.

Dr. Charles L. Bretschneider, formerly Chief of the Oceanographic Branch Division of the Beach Erosion Board, U. S. Corps of Engineers, has joined the National Engineering Science Company, Pasadena, California, as a member of the senior staff. Dr. Bretschneider is in charge of the firm's



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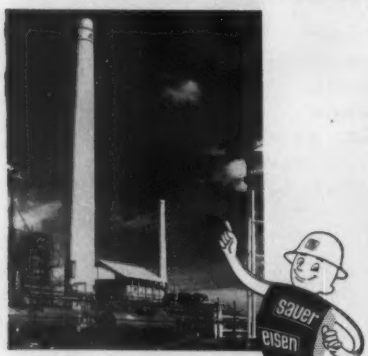

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new office at 1001 Connecticut Avenue, N. W., Washington, D. C. Another new member of the senior staff of NESCO is Dr. Basil W. Wilson, formerly professor of oceanography at Texas A & M.

Harry C. Grieme has been elected vice president of Walter Kidde Constructors, Inc., of New York and Houston. Grieme formerly was in the new business department of United Engineers and Constructors, Inc.

The following officers were elected at the recent annual meeting of Michael Baker, Jr., Inc., consulting engineers of Rochester, Pennsylvania: vice presidents, Michael Baker, III and Donald E. Wilson; assistant vice presidents, Granville Kester, Jr. and William O. Baker; assistant secretary and assistant treasurer, Mrs. Myrtle E. Baker. Minor E. Dean and Lloyd R. Smith, of the firm's southern division headquarters at Jackson, Mississippi, were named assistant vice presidents, and Henry A. Kajdan was named assistant secretary.

BAKER GRAHAM

James D. Graham, civil engineer in the Los Angeles firm of Albert C. Martin and Associates, architects, engineers, and planners, was elected president of the Engineers and Architects Institute. Graham has formerly served as second vice president and director. The Institute is a professional organization whose membership is made up of approximately 700 technical personnel engaged in various phases of engineering and architecture.

Frederick Carlton Gardner, president of Ebasco Services Incorporated, New York City, recently received an honorary degree of Doctor of Science from the North Carolina State College. Gardner's citation read in part: "As a distinguished engineer and an internationally recognized authority on public utilities... as one of our most accomplished alumni... and as a technologist of extraordinary merit and integrity..."

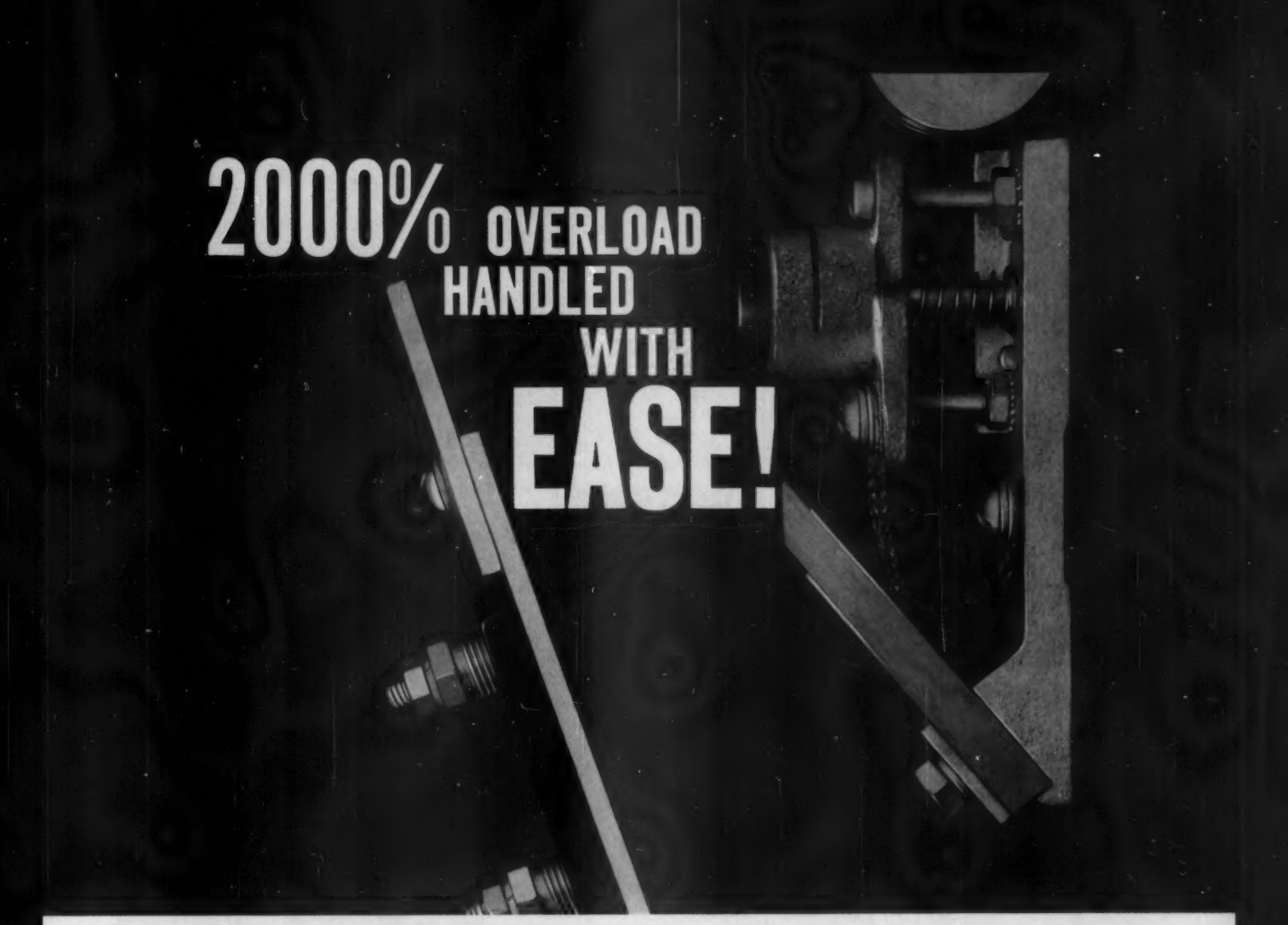
GARDNER WILLIAMS

James P. Williams, formerly Chief industrial engineer, Kaiser Steel Corporation, has been appointed manager, consulting services, for Arthur G. McKee & Company, Cleveland, Ohio. In this capacity, Williams will counsel McKee clients in feasibility of new facilities, cost analysis, availability of markets, and other details of construction planning.

Boni, Watkins, Jason & Co., Inc. has been merged into H. Zinder & Associates, Inc., according to a joint announcement issued by the presidents of the two companies. Boni, Watkins, Jason will operate as the economic and management division of the Zinder organization, with Boni as director.

W. S. Kerby, P. E. announces the formation of a new firm, Community Engineering Company, for the practice of civil engineering. Offices are located at 1410 West Fifteenth, Topeka, Kansas.

Joseph J. Waddell has become associated with Soil Testing Services,



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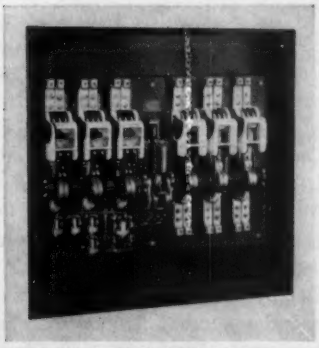

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Inc., Chicago, where he will be in charge of engineering inspection and quality control activities of the firm dealing with concrete and asphaltic materials. Until recently Waddell was chief materials engineer with Knoerle, Graef, Bender & Associates, Inc., consulting engineers for the Illinois Toll Highway program.

J. A. Elzi, M. C. Westrate, and C. E. Asbury have been elected vice presidents, and C. H. Alban and E. Weatherly, Jr. have been named directors of Commonwealth Associates, Inc., New York.

Charles P. Weisz has been appointed structural engineer for the Wire Reinforcement Institute. Weisz formerly was in charge of plan preparation for Hazelet & Erdal, consulting engineers, Cincinnati, Ohio.

New address of Cecil H. Wells, Jr., consulting engineer, is 2031 Pioneer Court, Suite 12, San Mateo, California.

Francis S. Friel, president of Albright & Friel Inc., consulting engineers, of Philadelphia, recently was awarded the honorary degree of Doctor of Science at Villanova University.

James "Pat" Murphy, of Crawford, Murphy & Tilly, Springfield, Illinois, has been elected president of the local Association of Commerce and Industry. Murphy also has been named "Illinois Engineer of the Year," by the Illinois Society of Professional Engineers.

Benjamin Silberstein has been appointed chief mechanical engineer of Benjamin & Flack, consulting engineers, New York City.

Three staff engineers have been taken into the partnership of Cornell, Howland, Hayes and Merryfield, consulting engineers, of Corvallis, Oregon. They are: Sidney S. Lasswell, project engineer; Robert R. Adams, project engineer; and Wayne C. Phillips, mechanical project engineer.

Lloyd K. Clark, consulting sanitary engineer and partner, of Clark and Groff Engineers, Salem, Oregon, is the new president of the Consulting Engineers Association of Oregon. He succeeds Harry Czyzewski, who becomes a member of the board of directors as immediate past president. Other officers are: Robert Welty, vice president; Omer Jacobson, secretary; and Robert Bonney, treasurer. New directors, in addition to Czyzewski, are Keith Kruchek, Ray C. Chewning, James C. Howland, and Walter J. Marquess.

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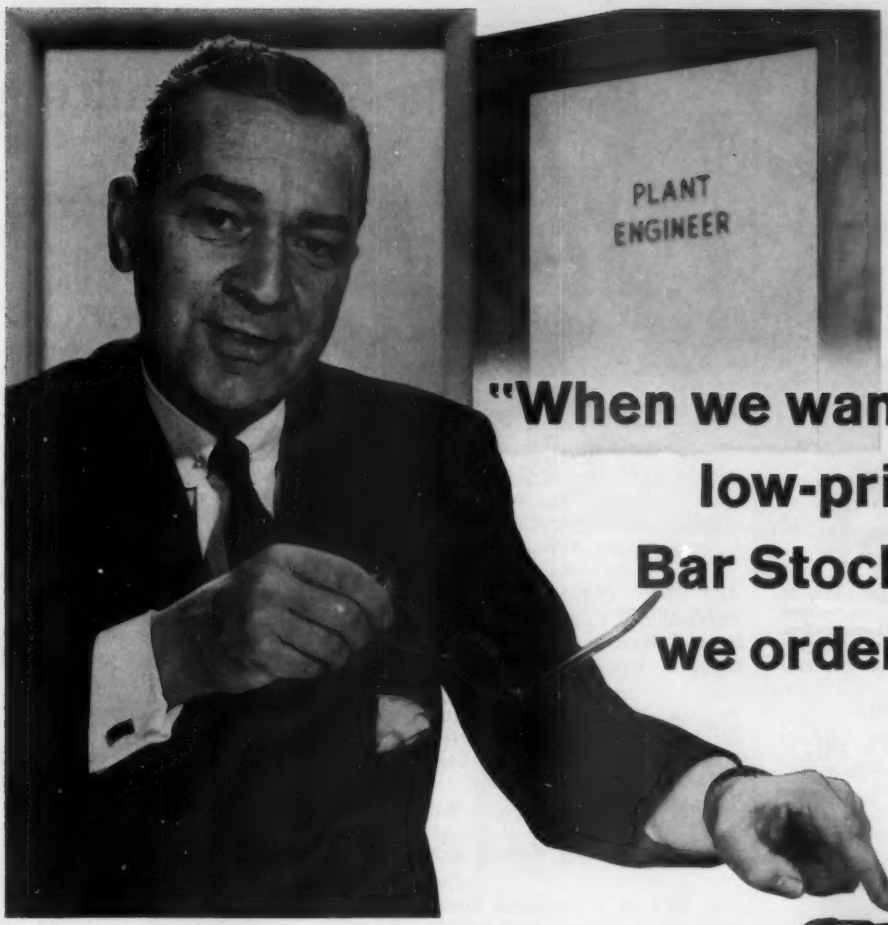
Six Minneapolis engineering firms, specializing in each major branch of the profession, have joined together to form the Alpha Engineering Company, with offices at 350 Builders Exchange Building. Firms comprising the new organization are: Jacus & Amble; Bruch & Morrow, Inc.; J. B. Calva Co.; David R. Conkey & Associates; Lindsey Engineering Co.; and Austin McInerny, Engineer. Officers are: Willis A. Jacus, president; David R. Conkey and G. Leigh Morrow, vice presidents; and Raymond E. Amble, secretary-treasurer. Directors are: Austin McInerny, James A. Lindsey, Wallace C. Bruch, Jose B. Calva, Conkey, and Jacus. Engineering services offered by the firm include civil, structural, mechanical electrical, and chemical. ▲▲



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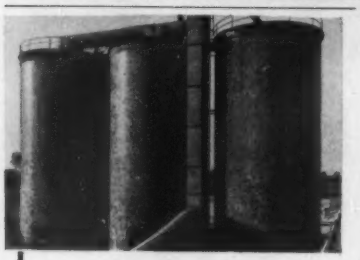

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Consulting Engineers' Calendar

Aug. 16-18. Hydraulics Division, American Society of Civil Engineers; 10th Annual Hydraulics Conference, Univ. of Illinois, Urbana, Illinois.

Aug. 20-24. University of Michigan; International Conference on Structural Design of Asphalt Pavement, Campus, Ann Arbor, Michigan.

Aug. 23-25. American Institute of Electrical Engineers; Pacific Meeting, Hotel Utah, Salt Lake City, Utah.

Aug. 24-25. University of Buffalo; Conference on Technical Manpower Utilization, Campus, Buffalo, N. Y.

Aug. 28-Sept. 1. American Society of Mechanical Engineers; International Conference on Heat Transfer, University of Colorado, Boulder, Colorado.

Sept. 6. American Institute of Consulting Engineers; Monthly Meeting, Engineers' Club, New York, N. Y.

Sept. 10-15. Pennsylvania State University; Seminar on Structural Aspects of Architectural Engineering, Campus, University Park, Pennsylvania.

Sept. 14-15. American Institute of Electrical Engineers, American Society of Civil Engineers, and American Society of Mechanical Engineers; Engineering Management Conference, Hotel Roosevelt, New York, N. Y.

Sept. 17-22. University of California; Short Course in Plant Layout, Material Handling, Warehousing, and Shipping, Lake Arrowhead Conference Center, San Bernadino Mountains, California.

Sept. 24-27. American Institute of Chemical Engineers; Annual Convention, Hotel Statler, New York, N. Y.

Sept. 25-28. Industrial Building Exposition and Congress, New York Coliseum, New York, N. Y.

Oct. 2-3. Engineers Council for Professional Development; Annual Meeting, Louisville, Kentucky.

Oct. 5-7. Structural Engineers Association of California; Annual Convention, El Dorado, Sacramento, Cal.

Oct. 7-10. Associations of the Western Building Industries Council; Western Building Industries Exposition, Great Western Exhibit Center, Los Angeles, California.

Oct. 8-11. American Institute of Mining, Metallurgical and Petroleum Engineers and Society of Petroleum Engineers; Fall Meeting; Dallas, Texas.

Oct. 8-12. Water Pollution Control Federation; 34th Annual Meeting, Schroeder Hotel, Milwaukee, Wis.

Oct. 15-19. Prestressed Concrete Institute; National Convention, Brown Palace and Cosmopolitan Hotels, Denver, Colorado.

Oct. 15-20. American Institute of Electrical Engineers; Fall General Meeting, Statler-Hilton Hotel, Detroit, Michigan.

Oct. 16-20. American Society of Civil Engineers; Annual Convention, Hotel Statler, New York, N. Y.

Oct. 17. American Institute of Consulting Engineers; Annual Dinner Meeting, Waldorf-Astoria Hotel, New York, N. Y.

Nov. 2-4. Consulting Engineers Council; Semiannual Meeting, Golden Gate Hotel, Miami Beach, Florida. ▲▲

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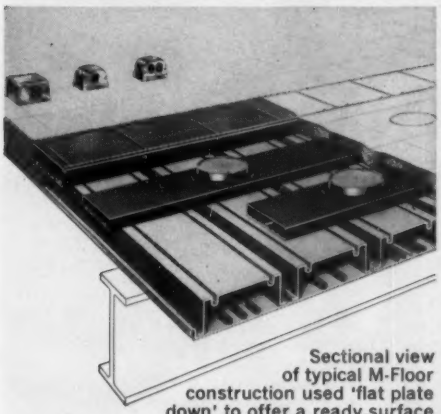
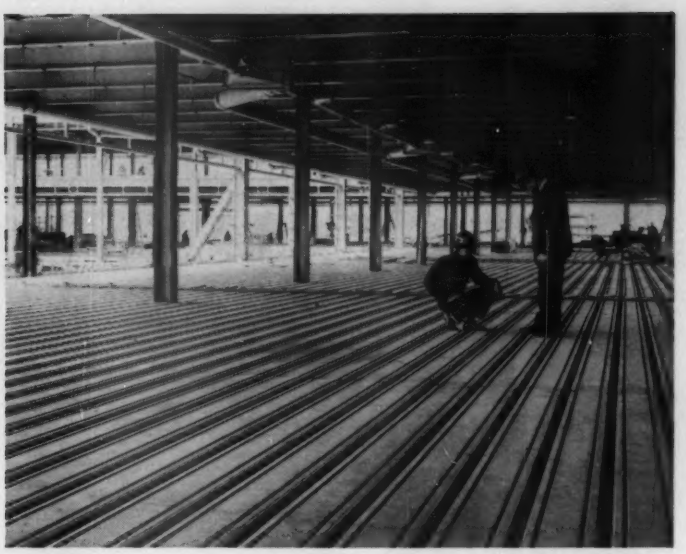


Sectional view of typical M-Floor construction used 'flat plate down' to offer a ready surface for spray-on fireproofing.



Mahon 3-in. beam depth M-Floors, during erection in eastern Pennsylvania project. General Contractor: McCloskey, Inc., Phila.

Artist's rendering of new facility for steel company. M-Floors permit quick...and flexible...electrical wiring of the facility. Architects: McKim, Mead & White, New York

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AA Wire Products Co. 134
ACF Industries, Inc., W-K-M Div. 147
Advance Transformer Co. . . . . 2nd Cover
Air Moving & Conditioning Assn., Inc. . . 50
Allis-Chalmers 71, 72, 73, 74, 135
Altec-Lansing Corp. 173
American Air Filter Co., Inc. 23
American Chain & Cable Co., Inc., R-P & C Valve Div. 181
American Gas Association 153
American Machine and Metals, Inc., DeBothezat Fans Div. 32
American Steel & Wire Div., U. S. Steel Corp. 138-139
Anaconda Wire & Cable Co. 163
Appleton Electric Co. 127
Armstrong Cork Co. 36, 37
Aurora Pump Div., New York Air Brake Co. 51
Automatic Switch Co. 179

Barber-Colman Co. 128-129
Benjamin Div., Thomas Industries 61
Bilco Co. 166
Borden Metal Products Co. 19
Buffalo Forge Co. 15
BullDog Electric Products Div., I-T-E Circuit Breaker Co. 137
Burgess-Manning Co. 12
Butler Mfg. Co. 31

Carrier Air Conditioning Co. 35, 143
Caterpillar Tractor Co. 59
Clay Sewer Pipe Association, Inc. 177
Columbus McKinnon Corp. Conveyor Div. 64
Conco Engineering Works, Inc. 7
Concrete Reinforcing Steel Institute . . . 170
Corning Glass Works 171
Crane Co. 158
Crouse-Hinds Co. 161

Dean Products, Inc. 182
DeBothezat Fans Div., American Machine and Metals, Inc. . . 32
Dow Chemical Co. 133
Dow Corning Corp. 65
Dunham-Bush, Inc. 45
Dur-O-waL Products, Inc. 53

Electric Cord Co. 24
Electric Storage Battery Co., Exide Div. 34
Everlasting Valve Co. 186
Exolon Co. 125

Flintkote Co., The, Orangeburg Div. . . . 142
Foster Co., Benjamin 151
Fuller Co. 38

Gamewell Co. 169
General Dynamics/Electronics 185
General Electric Co. 167
General Filter Co. 26
Globe Co. 174
Golden-Anderson Valve Specialty Co. . . 52
Guth Co., Edwin F. 21

Hamilton Kent Mfg. Co. 168
Hardinge Co., Inc. 20
Haws Drinking Faucet Co. 132
Heinemann Electric Co. 78
Hersey-Sparling Meter Co. 150

Ideal Electric Mfg. Co. 44
Illinois Water Treatment Co. 48
Industrial Combustion, Inc. 162
Infilco, Inc. 3
Inland Steel Products Co. 157
International Business Machines Corp. . . . 67

Johnson Co., S. T. 39
Johnson Service Co. 79

Kearney Co., James R. 156
Kemlite Corp. 158
Kennedy Valve Mfg. Co. 22
Kohler Co. 144
Koppers Co., Inc. 4
Kraloy/Chemtrol Co. 160

Layne & Bowler, Inc. 69
Leupold & Stevens Instruments, Inc. 175
Liquidometer Corp. 66
Lock Joint Pipe Co. 13

McAlear Mfg. Co. 58
mcPhilben Lighting Co. 176
Magnetrol, Inc. 40
Mahon Co., R. C. 183
Marsh Instrument Co. 140
Mears Controls, Inc. 152
Mid-Continent Metal Products Co. 153
Mission Valve & Pump Co. 155

Nesbitt, Inc., John J. 62-63
Niagara Blower Co. 162

Onan Div., Studebaker-Packard Corp. . 80-81
Orangeburg Mfg. Co., Div. of The Flintkote Co. 142

Pfaudler Permutit, Inc. 131
Pick Nicollet Hotel 168
Plankinton House 184
Platecoil Div., Tranter Mfg., Inc. 159
Powell Co., Wm. 76
Powers Regulator Co. 8-9
Pratt Co., Henry 126
Pringle Electrical Mfg. Co. 30

Rauland-Borg Co. 77
Recordak Corp. 25
Ric-wiL Inc. 124
Robinson Clay Products Co. 57
Rockwell-Standard Corp., Grating Div. . . 14
Roper Hydraulics, Inc. 60

Sauereisen Cements Co. 178
Schaub Engineering Co., Fred H. 6
Simplex Wire & Cable Co. 49
Skidmore Corp. 164
Solar Aircraft Co. 27
Square D Co. . . . . 3rd Cover
Stebbins Engineering & Mfg. Co. 182
Stephens-Adamson Mfg. Co. 11
Stran-Steel Corp. 130
Sumo Pumps, Inc. 178
Superior Combustion Industries, Inc. . . . 172
Surface Combustion, A Div. of Midland-Ross Corp. 68
System Analyzer Corp., Add-A-Phase Div. 180

Thompson Electric Co. 148
Tinker & Rasor 146
Tube Turns Plastics, Inc. 70

U. S. Steel Corp. 46-47
American Steel & Wire Div. 138-139

Vogt Machine Co., Henry 33

Walker Process Equipment, Inc. 145
Water Saver Faucet Co. 170
Webster Engineering Co. 56
Western Engineering & Mfg. Co. 136
Westinghouse Electric Corp., Agency & Cons. Div. . . 120, 121, 122, 123
Dry Type Transformer Div. 54-55
Standard Controls Div. 16-17
White Diesel Engine Div., White Motor Co. 41
Williams Equipment & Supply Co. 42
W-K-M Div. of ACF Industries, Inc. . . . 147
Wood Co., R. D. 43
Worthington Corp. . . . . 4th Cover

Yarnall-Waring Co. 83
Youngstown Sheet & Tube Co. 149

Zurn Industries, Inc. Hydromechanics Div. 28-29

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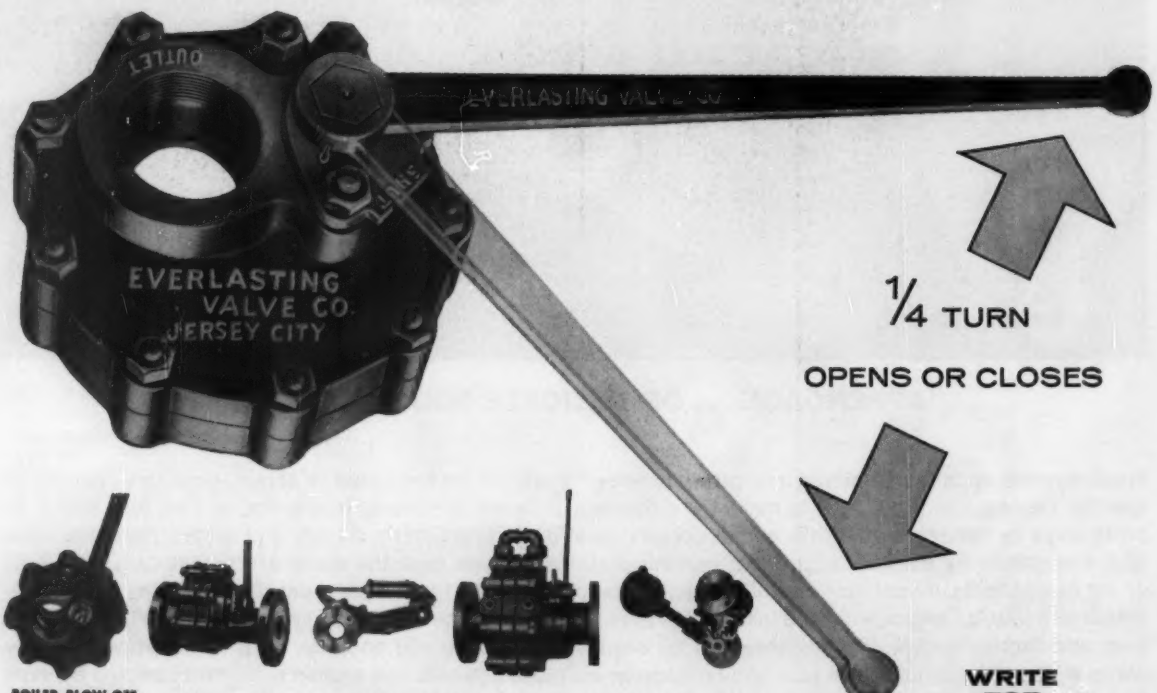

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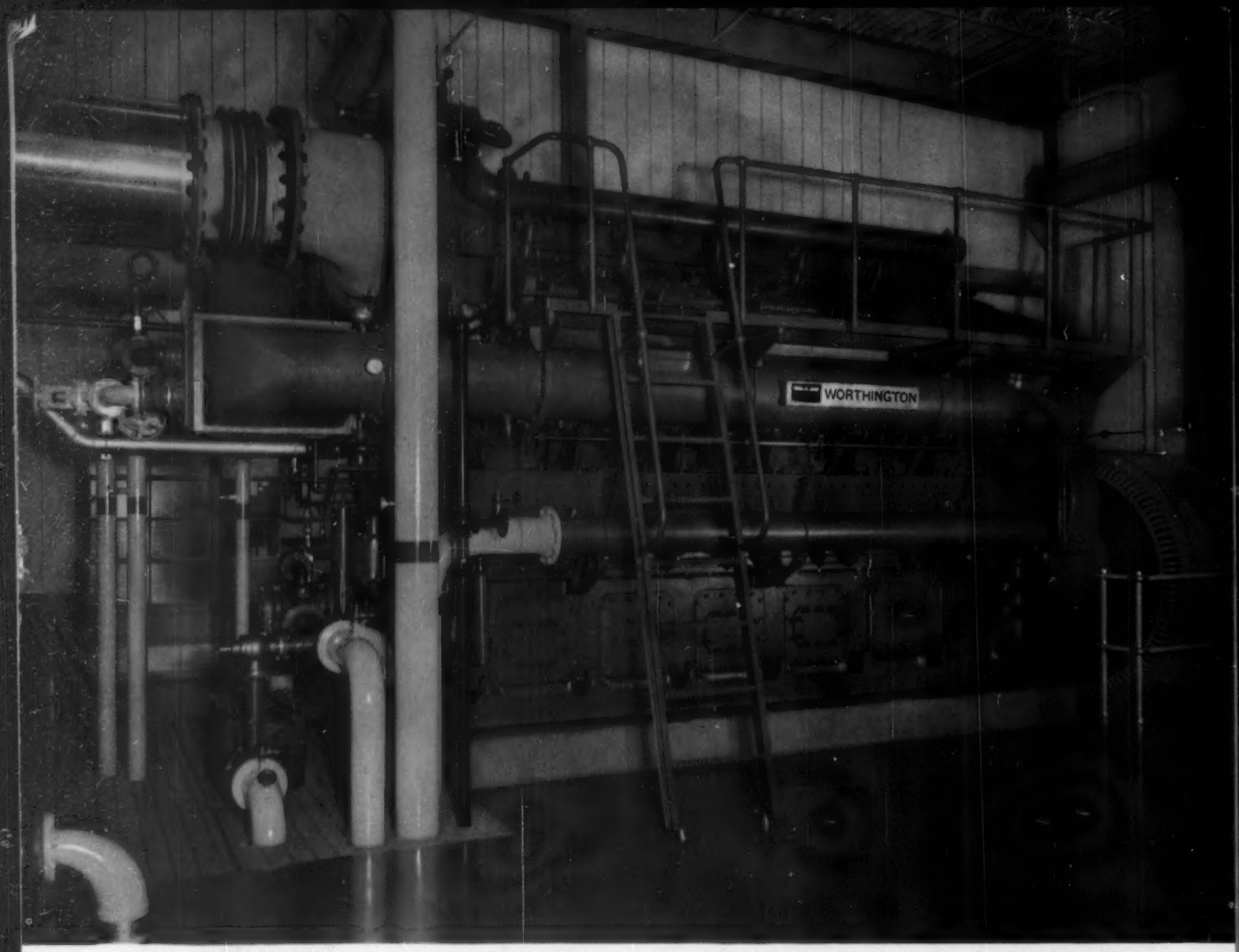

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BIG DIESELS...EVERYMAN'S POWER

In the small community . . . in industry . . . in nearly every utility, there's a place for big diesel power. Its place is justified even under the most rigorous analysis of options and profit.

Look at capital outlay. With current costs per kw for big diesel generators, you'll seldom find a less expensive way of providing generating facilities for installations up to 20,000 kw, or so. Located near the load, they cut transmission facility costs and transmission power losses.

Look at capital conservation. Diesel power can be added in increments to meet peak load increases. Thus capital outlay parallels load build up—with no purchase of unused capacity. In multi-diesel plants, this concept holds true for operation, too. Only enough units are run to meet the load, eliminating continuous operation of a partially loaded oversized unit.

Look at fuel economy. There's no more thermally efficient power source than the big diesel generator. A typical 3,000 kw Worthington unit is, for example, 25% more efficient than a comparable steam or gas turbine. And only the big diesel has these fuel options—fuel oil, gas or a mixture of both. Thus fuel selection is advantageously geared to price or availabilty.

Yes, applied properly, the big diesel is "everyman's" power. It's as profitable for main power generation in a smaller power system as for power peaking in the largest power system. To these big diesels Worthington brings such features as high pressure turbocharging for efficiency, instantaneous fuel switching during operation, and extremely high heat recovery . . . nearly doubling efficiency, if measured by crankshaft output alone.

To learn more about the big engines for power generation and about the Worthington 500 to 5000 hp units, write Worthington Corporation, Section 43-23, Harrison, N. J. In Canada, Worthington (Canada) Ltd., Brantford, Ontario.

WORTHINGTON

PRODUCTS THAT WORK FOR YOUR PROFIT

2

PART 2

Consulting Engineer

DIRECTORY OF ADVERTISERS' LITERATURE

Keep This Directory in Your Technical Reference File

ST. JOSEPH, MICHIGAN

Part 2

August 1961

	Page
Air Cleaners & Dust Collectors	3
Air Conditioning & Refrigeration Equipment	4
Building Materials	7
Communication & Signal Equipment	8
Electrical Apparatus	10
Engineers' Office & Field Equipment	18
Fire Protection Equipment	19
Heat Exchangers & Water Heaters	19
Heating & Ventilating Equipment	20
Highway, Bridge & Street Materials	23
Industrial Processing Equipment	25
Instruments & Controls	26
Insulation & Protective Coatings	29
Lighting Fixtures & Accessories	30
Materials Handling & Storage Facilities	34
Mechanical Power Transmission	37
Motels & Hotels	37
Piping, Valves & Plumbing Supplies	38
Plant Sites	44
Power Equipment & Fuels	44
Pumps & Compressors	48
Structural Materials & Equipment	51
Waste Disposal Equipment	56
Water Treatment Equipment	57
Index	58

Consulting Engineer

Wayne near Pleasant Street
Saint Joseph, Michigan

Dear Reader:

When you need information on products you may want to include in your specifications, you probably want the information in a hurry. A month or six weeks delay is no good.

Here is your August issue of CE's Directory of Advertisers' Literature. You will find in it just about every category of interest to you.

The card you fill out will be processed on our IBM equipment and in the mail to the manufacturer within 48 hours of when it reaches us.

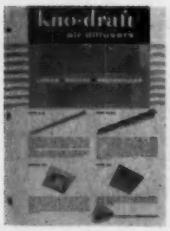
We invite you to use this service and receive the quick response so important to you.

Cordially yours,

Cullen S. Child

CULLEN S. CHILD
Merchandising Director

AIR CLEANERS & DUST COLLECTORS



1—Air Distribution and Purification

Bulletin 31F describes representative models in the Kno-Draft lines of air diffusers, grilles and registers, and high velocity equipment, and the Dorex line of air recovery and purification cells and canisters. Recent additions to the "Architects' Group" of rectilinear diffusers, type KO perforated, type KSS vari-pattern.

Connor Engineering Corp.

2—Dust Collection Equipment

Bulletin 721 describes the *Dustkop* Series 300 dust collector designed for laboratory type grinding and polishing. It is an air recirculating type collector, with an air volume of 260 cfm to 314 cfm and a dust storage capacity of 1/10 cubic foot. Complete dimensional data are shown clearly on line drawings.

Aget Manufacturing Co.

3—Fly Ash Collector

Bulletin describes Buell's "LR" fly ash collector for fly-ash prevention on small boiler installations. Graphs show collection efficiency and draft loss. Tabular size selection table gives boiler data, flue gas, and proper model. Dimensional diagram is accompanied by table of sizes. Line drawings show operation.

Buell Engineering Co., Inc.

4—Cube Replacement Air Filters

Bulletin B, 4 pages, illustrated, describes cube air filters. Physical process of reverse loading, primarily responsible for high efficiency and long life of unit, is described in detail. Diagram illustrates typical arrangements, and data table lists capacity and resistance of dozen sizes. Assembly procedures pictured.

Union Carbide Development Co.

5—Industrial Dust Collectors

Catalog 359 describes briefly complete line of Torit dust collectors for industry. Current models of both self-contained cabinet cloth filter type and cyclone separators are illustrated with dimensions and specifications for each. Installation photographs illustrate all models in use. Accessories are listed.

Torit Manufacturing Co.

6—Electronic Air Cleaner

Catalog 1435 describes Westinghouse's heavy duty Model PD *Precipitron*. This comprehensive catalog outlines the principle of electronic air cleaning and shows in cutaway the construction. Diagram illustrates sectionalized arrangement to provide continuous air flow and cleaning. Selection data includes dimensions.

Westinghouse Electric Corp.

7—Fume and Mist Precipitator

Bulletin 251C describes Model B *Electro-Mist*, electronic precipitator for oil mist, fume collection. Self-contained unit abates fire hazards created by condensed oil mist, reduces need for frequent cleaning of adjacent areas, collects up to 10 gallons of oil per day for re-use, returns cleaned air to work room.

American Air Filter Co., Inc.

8—Oil Bath Air Cleaner

Bulletin 160-C describes new *Cycoil*, Type P, low resistance oil bath air cleaner for smooth flow applications. Provides complete operation information, detailed parts drawings, construction features, dimension drawings, oil recommendations, maintenance procedures, filter cell service, size selections.

American Air Filter Co., Inc.

9—Renewable Media Air Filters

Bulletin 248-E combines technical information for both the vertical and horizontal models of the *Roll-O-Matic* automatic renewable media air filter. Explains the modular design which permits easy, on-the-job assembly. Includes dimension drawings, capacity tables, shipping weights, discussion of media.

American Air Filter Co., Inc.

10—Dry-Type Unit Filter

Bulletin 228 describes new *DRI-Pak* dry-type unit filter. Light-weight unit answers need for high efficiency, low resistance, compactness and unusual dust holding capacity. Filter inflates when system is in operation, deflates when shut down, contains disposable cartridge, requires less storage space.

American Air Filter Co., Inc.

11—Electrostatic Precipitators

Bulletin 2128 describes a new line of electrostatic precipitators. Standard units in 72 sizes available. Units have the following improved features: factory preassembled for economical installation, unique collector plate design, and pneumatic or electric rapping. Mechanical collector bulletins available.

American-Standard Industrial Division.

12—Dust Control Equipment

Bulletin No. 805 describes a complete range of dry collection equipment including the multi-bag filter, uni-filter, glass bag filter, *Whirl-clone*, special collectors, and accessories. Illustrated application data show how equipment is used in industry to collect dust and to reclaim reusable material. Illustrated.

Dracco Division of Fuller Co.

AIR CLEANERS & DUST COLLECTORS *continued*

13—Dust Collectors

Bulletin 727 describes *Dustkop* dust collector Series No. 5000, which is suitable for grinding, buffing, polishing, woodworking, machining and other applications where large volumes of air are required. Will service up to eleven combinations of machines. Air volume 5000 cfm, capacity to 38 cu ft.

Aget Manufacturing Co.

16—Dust Collection Systems

Bulletin 61 describes the complete line of Buell-Norblo dust collection and recovery systems. Included are electric precipitators, mechanical collectors, bag collectors, systems. Photographs show installations of equipment. Cutaways show construction. Comprehensive bulletin on each type of equipment.

Buell Engineering Co., Inc.

14—Automatic Dust Collector

Bulletin FM60 describes new line of Torit fully automatic continuous operating dust collectors. Available in ranges up to 60,000 cfm and higher, these collectors are of extremely high efficiency, yet weigh less than one-half of standard equipment due to their aluminum construction. Illustrations show application.

Torit Mfg. Co., Automatic Division.

17—Panel-Type Air Filters

Bulletin Al, 4 pages, illustrated, describes advantages of new filter which provides up to 100 per cent longer life than other throw-away types. Describes how three-dimensional bat permits elimination of face supports and facilitates depth loading. Installation data, filter sizes, and arrangement.

Union Carbide Development Co.

15—Air Purification Equipment

Bulletin 108A describes and illustrates *Dorex* activated carbon air purification equipment, C cells and H canisters. Data on equipment selection, installation, application is provided. Also given is information on unique *Dorex* replacement service. Discussions of activated carbon and conditions for proper purification.

Connor Engineering Corp.

18—Air Hygiene

Bulletin K-856 analyzes problems of micro-organisms in industrial processing plants and hospitals. Solution with *Kathabar* equipment is offered. *Kathabar* systems destroy 97% of bacteria and mold in hospitals, food and chemical plants, and maintain specified humidity conditions. Two bulletins will be sent.

Surface Combustion.

AIR CONDITIONING & REFRIGERATION

19—Multi-Drive Compressors

Bulletin 790 contains complete specifications and easy-to-use rating tables of the multi-drive line of air conditioning and refrigeration compressors and condensing units. Direct drive, semi-hermetic and belt drive units are covered. Cutaways and engineering data help engineer to readily select proper unit.

Dunham-Bush, Inc.

21—Engineered Air Distribution

Condensed catalog F-4471-8 allows designers of air distribution systems to quickly survey the wide range of equipment designs, sizes, finishes, and applications available from Barber-Colman. Included in this 1961 catalog is information on new continuous-line diffusers in several basic styles.

Barber-Colman Co.

20—Heating and Cooling Coils

Catalog HC-1 gives complete construction specifications and dimensions on the Bohn line of direct expansion, water, and steam coils. This engineering manual is tailored to the needs of a specifying and design engineer as it provides a wide range of capacity data in easy-to-use direct selection tables. Illustrated.

Bohn Aluminum & Brass Corp.

22—Dual Duct Air Mixing Units

Bulletin DD-6 describes dual duct air mixing units for high and low velocity systems. Detailed information includes blue prints showing different arrangements for same space, cross-section diagrams, dimensions, performance data, and complete specifications. Installation and product photographs are shown.

Buensod-Stacey, Inc.

AIR CONDITIONING & REFRIGERATION *continued*

23—Packaged Liquid Chillers

Catalog ME-123 covers "W" Series packaged liquid chillers – 15 to 125 hp – with photographs, cutaway drawing, ratings, capacities, condenser capacity, physical data, and dimensional drawings on Chrysler Airtempt Applied Machinery and Systems Department's liquid chillers, commercial and industrial.

Chrysler Corp., Airtemp Division.

24—Central Air Conditioning Units

Catalog 383A describes Model ACM multi-zone central station type air conditioning units from Acme Industries. They serve up to 16 separate zones and are available in 5 sizes with 56 coil combinations. One unit heats, cools, filters, humidifies, dehumidifies in any combination, singly or simultaneously.

Acme Industries, Inc.

25—Dry Expansion Coolers

Whether your job requires a shell and tube (or straight) type of cooler, or a shell and coil (or U-tube) application, you can find descriptions, selection data and dimensions in this new Carrier Bulletin 10-4. Designed for use with water and other fluids, there is a complete capacity coverage.

Carrier Air Conditioning Co.

26—Air Conditioning Silencers

A complete line of *Aircoustat* products by Koppers Sound Control Department is presented in bulletin 2166. Products covered include standard duct sound traps, circular silencers, return air vent silencers, and cooling tower silencers. Cutaway shows construction and features. Sales representatives listed.

Koppers Co., Inc.

27—Water Chilling Systems

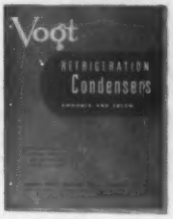
Bulletin L160.25S describes the York gas engine driven *Turbomaster* water chilling system, capacity from 90 to 600 tons. Complete specifications include information on compressor, condenser, chiller, control, and engine. Complete tabular dimensions are keyed to line drawing. Features are outlined.

York Corp., Sub. of Borg-Warner Corp.

28—Cooling Coils

Bulletin 11 describes Marlo direct expansion and water coils of the serpentine type. Information includes design features, construction, and types of cooling coils available. Dimensional data for water and direct expansion coils include diagrams, and tabular dimensions. Other Marlo products are illustrated.

Marlo Coil Co.



29—Refrigeration Condensers

Engineering data on a complete range of sizes and types of condensers for ammonia and Freon refrigerants are given in 40-page bulletin RC-2, "Refrigeration Condensers." Closed, horizontal multipass types, and open, vertical single-pass types are featured. Piping sizes and temperature tables also are included.

Henry Vogt Machine Co.

30—Precision Air Conditioning

Bulletin 122 describes Niagara's Type A air conditioner for precise control of air temperature and moisture. Many installations are shown in photographs. Line drawing illustrates operation and shows components. Applications demanding precision control of temperature and moisture are listed. Useful in processing.

Niagara Blower Co.

31—Air Conditioning Unit Ventilators

Bulletin 635-EIA contains complete data for application of *Hernel-Cool* III air conditioning unit ventilators for school classrooms. Construction features, system design, operation and controls, selection procedures, capacity tables and charts, dimension and application drawings, and suggested specifications.

American Air Filter Co., Inc.

32—Control Centers

Publication 1040 describes the latest developments for centralized control of air conditioning, heating, and ventilating systems. New modular units include equipment for data collection, indication, recording, motor control, digital indication, data logging, alarms, and intercommunication. Illustrated.

Johnson Service Co.

33—Copper-Alloyed Galvanized Steel

Bulletin WC-255 describes the ultimate in galvanized sheets for air conditioning ducts and other applications, *SofTite Cop-R-Loy* galvanized sheets. Description of product, how and where it has been used, its manufacturing process, and other subjects are covered in detail with words and photographs.

Wheeling Corrugating Co.

34—Central Air Conditioners

New bullein AC-121 gives complete data on "Buffalo" Model G central station air conidtioning cabinets. Type PC for horizontal floor or ceiling installation, type UPC for vertical operation, type PCW spray coil for horizontal operation, type VPCW spray coil for vertical operation. Details on performance data.

Buffalo Forge Co.

AIR CLEANERS & DUST COLLECTORS *continued*

35—Low Silhouette Condensing Units

Eight looseleaf pages, Form 7017-1A, present technical data for "LSCU" low silhouette condensing units. Includes nominal ratings for 14 basic sizes, 5 thru 40 tons, as well as specification comparison, wiring diagrams and dimensions for all models. Contains supplemental data to Bulletin 7017.

Dunham-Bush, Inc.

36—Air Conditioning Units

Bulletin 230 describes Bohn's new line of remote air conditioning units. Capacity data is given for direct expansion, cold water, hot water, and steam. Six models provide cooling capacities from 2 to 15 tons to handle a wide variety of applications. Tables show refrigeration and air conditioning capacities.

Bohn Aluminum & Brass Corp.

37—*Electronic*® Control Centers

Advantages and types of *Electronic*® control centers for air conditioning and heating systems are described in booklet F-8031-1. Graphic, selectronic, and identification centers for commercial and industrial buildings detailed. Flexibility explained and illustrated. Check list for control center planning.

Barber-Colman Co.

38—Dual Duct Air Conditioning

Bulletin DD-7 discusses space requirements for risers, apparatus rooms and ceiling arrangements for dual duct air conditioning systems. Includes basic apparatus arrangements, methods of design, and a discussion of the results to be obtained. Isometric examples of air distribution methods and other information.

Buensod-Stacey, Inc.

39—Air Conditioning Products

Catalog LL-349 covers in detail the many products for industrial and commercial air conditioning manufactured by Chrysler Airtemp Applied Machinery and Systems Department. Includes data and ratings on packaged and liquid chillers, large central station packaged air conditioners, and air handling units.

Chrysler Corp., Airtemp Division.

40—Packaged Liquid Chillers

Catalog 91-511 describes and illustrates Acme's complete line of RF *Flow Cold* packaged liquid chillers. Offered in 8 models in capacities from 3 to 30 tons. Model RF chillers are available in with either single or dual compressors. Catalog furnishes complete selection data, dimensions, and specifications.

Acme Industries, Inc.

41—Air Conditioning Control Manual

Engineering manual of automatic control for commercial air conditioning is offered by Minneapolis-Honeywell. This 324 page technical handbook covers theories af air conditioning and control, control and instrumentation application, typical specifications and engineering data. Schematics and wiring diagrams.

Minneapolis-Honeywell Regulator Co.

42—Return Air Vent Silencers

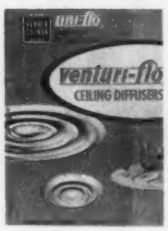
Bulletin 2000-M88 describes *Aircoustat* vent silencers, a sound trap used in preventing the transmission of noise from one area to another. Typical installations are diagramed. Complete sizes and dimensions for all models are given. Installation data, performance chart, and chart of pressure drops between areas.

Koppers Co., Inc.

43—Commercial Weathermakers

Whether you design, specify or install commercial air conditioning systems, you will be interested in this new Carrier catalog 41E26. It furnishes complete description and ratings on 4 commercial models with capacities ranging from 25 to 50 tons. Ratings are included for water, air, or evaporative cooled.

Carrier Air Conditioning Co.



44—Ceiling Diffusers

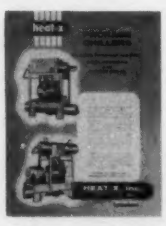
Catalog F-4085-6 includes descriptions of *Venturi-Flo* ceiling diffusers, application and selection data, and ordering information. Revised performance tables make selection easier and faster. *Deflectrols,* volume controls, and other accessories are also included. Installation instructions given.

Barber-Colman Co.

45—Food Service Cooling, Heating

Bulletin 669 describes *Snopan* and *Colplate* for refrigerating food on counters and in storage and also *Steempan* and *Panelcoil* for steam tables, bain maries, plate warmer cabinets, shelf warmers, kettles, water heaters, other uses. Illustrations show construction and applications. Data on specifications needed.

Dean Products, Inc.



46—Packaged Chillers

"PC" Package Chiller Catalog 8023A lists mechanical specifications (20 thru 100 tons), construction details of chiller, cleanable condenser-receiver, heat interchanger. Compressor data, selection guide, capacity and pressure drop tables, dimensional diagrams for semi-hermetic and direct drive models. Dimensions.

Heat-X, Inc., Sub. of Dunham-Bush.

BUILDING MATERIALS

47—Spring-Assisted Access Doors

Catalog describes horizontally hinged *spring-assisted* access doors. Complete line includes roof scuttles, smoke hatches, ceiling access doors, flush floor doors, sidewalk doors, basement doors. Specification outlines materials, prices, and weights. Line drawings show operation. Sales offices listed.

BILCO Co.

48—Fluid Roofing Material

Catalog R1-6-1260B fully describes a new and revolutionary elastomeric roofing material, designed especially for roofs of unusual design or configuration. This roll-on, plastic roofing is available in many colors. Advantages are outlined and illustrated. Step by step application of Armstrong F/A roofing in pictures.

Armstrong Cork Co.

49—Metal Lath and Accessories

Catalog 202 contains illustrations, installation details, load tables, descriptions, and product data on lathing and plastering accessories for *Milcor* firesafe construction. Includes *Milcor* access doors, *Milcor* interior metal trim and products for use with acoustical plaster and tile. Fully illustrated.

Inland Steel Products Co.

50—Rolling Door Motor Operator

Bulletin 111 is a complete catalog on new power operator for motor operation of metal rolling doors manufactured by Kinnear. Includes complete specifications, dimensional data and outlines the advantages of power operation for heavy doors. Describes line of accessories and types of operating controls.

Kinnear Manufacturing Co.

51—Metal Rolling Doors

Bulletin 104, 36 pages, is a complete catalog of the many types of doors made by Kinnear. It gives information on the types of operations, both manual and electrical; elevation drawings, mounting methods for various applications and locations; specifications; and explains special construction features of these doors.

Kinnear Manufacturing Co.

52—Steel Roof Decks

Bulletin WC-241 outlines 21 important advantages of Wheeling's two new styles of roof decks, narrow and wide rib. Load tables, suggested specifications and other technical data included. Bonderized *Super-Rib* decks are roller painted then supplied in unlimited lengths, 2'-0" widths. Used also for wall panels.

Wheeling Corrugating Co.

53—Colored Asbestos-Cement Sheets

Bulletin describes "K&M" *Asbestos-Cement* structural sheets in *Kolor-Mate* colors developed exclusively for Keasbey and Mattison. Sheets have basic asbestos-cement virtues, durability and freedom from maintenance. Colors won't blister, peel, fade, or yellow. Won't crack or chip during installation of sheets.

Keasbey & Mattison Co.

54—Roof Deck Colors

Bulletin describes *Insul-Tones*, the colors in which Insulrock roof deck is available. Five colors are blue, pink, beige, green, and yellow. Colors are shown in this folder. All are factory-painted, quality controlled colors. High light reflective quality make this roof deck functional as well as beautiful.

Flintkote Co., Insulrock Division.

55—Curtain Wall Systems

Catalog C-62 outlines Bayley aluminum or steel curtain wall systems and insulated panels with Bayley aluminum projected windows. Advantages of Bayley curtain walls include choice of distinctive wall treatment without cost of special design, a wall engineered to accommodate a building's movement.

William Bayley Co.

56—Color-Coated Steel Panels

Bulletin 60-1-258-Rev. describes Stran-Satin the color-coated ribbed steel panels. Panels in nine basic colors shown together with suggested color combinations. Colors prove functional and protective as well as pleasant and smart. Shows how these factory-applied, protective coatings are baked on layer after layer.

Stran-Steel Corp.

57—Polyester Acoustical Tile

Special 5 x 8 inch samples of *Kemdot*, glass fiber reinforced polyester acoustical tile have been prepared for distribution to consulting engineers by the manufacturer, Kemlite Corporation. Available in white and pastel colors. Samples come in envelopes which provide complete technical and test data.

Kemlite Corp.

58—Spring-Assisted Doors

Scale detailed drawings of horizontally hinged *spring-assisted* doors. Complete line includes roof scuttles, smoke hatches, ceiling access doors, floor doors, pit doors, and basement doors with steel stair stringers. Specifications, standard sizes, and weights included. Sales offices in this country and Canada listed.

BILCO Co.

BUILDING MATERIALS *continued*

59—Fire Guard Acoustical Ceilings

This kit contains catalogs and specification data on the complete line of fire protective ceilings by Armstrong, including the new Acoustical Fire Guard Lay-in system. Perspective and elevation drawings are included. Both tile and lay-in systems have been tested and rated by Underwriters Laboratories.

Armstrong Cork Co.

60—Insulated Wall Panels

Catalog 243 describes Inland's line of insulated, non-load bearing wall panel systems and uninsulated siding. The eight-page folder includes selection data, physical properties, construction details and suggested architectural and engineering specifications. Erection procedures are illustrated.

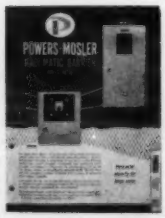
Inland Steel Products Co.

COMMUNICATION & SIGNAL EQUIPMENT

61—Time Recording Systems

"First quality for Timing Accuracy" contains general description of electronic, synchronous wired, and *Autoset* impulse time and program systems with illustrations of the master time control, secondary clocks, and signals. Also illustrated and described briefly are attendance time recorders, job cost recorders.

Stromberg, Div. of General Time.



65—Perimeter Security Systems

Bulletin 66D describes the Powers-Mosler *Radi-Matic* Barrier, an electronic fence which provides perimeter protection for storage depots, industrial property, military installations, and other areas needing maximum security. Includes description of monitor unit, transmitter, and antenna. Specifications given.

Powers Regulator Co., Powers-Mosler Div.

62—In-Wall Amplifier

Specifications 4.1.14 describes Rauland-Borg's new In-Wall amplifier for perman-Borg's new *In-Wall* amplifier for perman-requires only 4 inches depth. Complete engineering specifications are given. Unit is illustrated. Wiring diagram included. This completely transistorized amplifier has 4 low impedance microphone inputs.

Rauland-Borg Corp.

66—Industrial Lamp Annunciators

Bulletin A-200 describes Edwards' new line of industrial lamp annunciators, which indicate visibly and audibly any abnormal condition in an automated or process system. Line features modular plug-in circuits and data logging or auxiliary control terminals. Includes selector chart, dimensions, components.

Edwards Co., Inc.

63—School Communication Systems

New product bulletin S-144 describes the most complete and advanced school communications systems available. The Stromberg-Carlson school system handles high fidelity radio and phonograph announcements as well as emergency-disaster warnings to all classrooms. Built and engineered to specific requirements.

Stromberg-Carlson.

67—Stereo and Hi-Fi Music Systems

Altec's new catalog AL 1302-1 features illustrations of custom stereophonic and monophonic installations. A special feature is the selection chart which diagrams the proper placement of speakers and other components in a room. All components are described in detail, with technical information and specifications.

Altec Lansing Corp.

64—Speaker select-a-guide

Speaker *Select-a-guide*, form 3J4217, for planning auditorium sound systems. Brochure contains descriptions and specifications for recommended speakers, a quick method for calculating number of speakers required, diagrams showing location of speakers for both high and low level sound coverage in auditoriums.

Radio Corporation of America

68—School Sound Systems

Brand new four-page brochure 8000 E-60 illustrates and describes all standard school sound systems. Covers equipment suitable for the smallest to the largest school units. Building block flexibility of console styles, panels and functions explained. Specification sheets furnished on request. Completely illustrated.

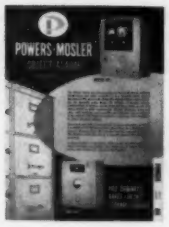
DuKane Corp.

COMMUNICATION & SIGNAL EQUIPMENT *continued*

69—Modular Sound Select-a-Guide

Bulletin 3J3668 is fold-out brochure which describes plan and functions of the new RCA Modular Sound Systems. Systems feature a variety of standard assemblies suitable for mounting in any of five basic cabinet units, enabling you to select the exact combination of sound functions and controls you require.

Radio Corporation of America.



70—Security Alarm Systems

Versatile Powers-Mosler object alarm system for fool-proof protection of specific objects such as safes, desks, file cabinets, and storage lockers which require security is described in circular 66B. Consists of signal unit and transistorized monitor unit. Gives no signal to warn intruder.

Powers Regulator Co.

71—Structural Sound Systems

Structured Sound Systems literature package to simplify specification of equipment for auditoriums includes 14 four-page folders. Each gives sound equipment recommendations for a typical auditorium of a specific size and configuration. Auditoriums range from 300 to 2000 seats. High and low level systems.

Radio Corporation of America

72—Clocks and Signals

New engineers' and architects' catalog contains general descriptions, illustrations, specifications, and complete details on time and program systems (electronic, synchronous wired, *Autoset* impulse); clocks (secondary, synchronous, wall, double-faced, tower, special designs); signal equipment.

Stromberg, Div. of General Time.

73—Automatic Nurses' Call Systems

New bulletin 8035 on hospital communications describes the most wanted services: nurse-patient-staff communications; automatic monitoring of patients' rooms; plus multichannel music/program distribution systems. Includes full description and illustrates various components. Lists typical users.

DuKane Corp.

74—Personnel Paging Systems

Bulletin A-100 describes the new Edwards *Lokator*, an audible paging system designed to page key personnel wherever they are needed in a hurry. Foolproof operation, automatic code paging, designer styling to blend with office decor and rugged construction. Twenty, forty, and eighty call systems available.

Edwards Co., Inc.

75—TV Equipment Catalog

Complete catalog of Blonder-Tongue's line of master antenna equipment, UHF converters, and closed circuit products. Each piece of equipment is completely described and pictured. Catalog numbers make ordering easy. Closed circuit TV products include types of cameras, consoles and monitors, auxiliary equipment.

Blonder-Tongue Laboratories, Inc.

76—Master TV System Manual

Master TV manual written especially for engineers designing master antenna signal distribution. Shows components used in master TV systems, engineers' specifications, glossary of terms, charts, and tables. Section contains information on how to calculate electronic signal gains and losses. Wiring diagrams included.

Blonder-Tongue Laboratories, Inc.

77—Sound Specification Manual

Engineering specification manual, 65 pages, gives complete detailed specifications on central sound systems for schools, industry, and institutions. Single, dual, and three channel systems are fully outlined with typical systems specifications covering the entire equipment for modern sound coverage.

Rauland-Borg Corp.

78—Public Address Systems

New catalog SWC 17e/AL describes and shows examples of Altec's sound system building block flexibility. Each specialized component illustrated in the catalog is designed to work in complete harmony with every other item in the Altec line: microphones, amplifiers, preamplifiers, loudspeakers, and horns.

Altec Lansing Corp.

79—Plant Security Systems

Bulletin 66B describes the Powers-Mosler Sentry Unit used in military and classified industrial installations for maximum security. Technical descriptions of the monitor unit and line supervision. Line drawings supply dimensions. Specifications include finish, mounting, signal power supply, emergency power supply.

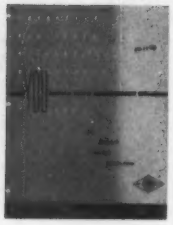
Powers Regulator Co., Powers-Mosler Div.

80—Functional Sound

Product catalog S-11D describes and illustrates Stromberg-Carlson's full line of communications systems including *Pagemaster* selective wireless paging system and private automatic telephone systems. The catalog includes planning check list and selector chart. Components and accessories are illustrated.

Stromberg-Carlson.

ELECTRICAL APPARATUS



81—Circuit Breakers

"What You Should Know About Circuit Breakers for Branch Circuit Protection," 16-page manual 101, describes ways of protecting your client from fire, equipment damage, excessive wiring costs, and needless circuit interruptions. How hydraulic-magnetic circuit breakers provide this protection is pointed out.

Heinemann Electric Co.

82—Load Break Switch Tests

Bulletin P-112 gives detailed results of an extensive test series conducted on the Pringle load break switch for service entrance, 2000 and 4000 ampere, in both graphic and tabular form. Four basic types of tests were run to evaluate switch performance over a wide range of conditions. Tests Certified.

Pringle Electrical Manufacturing Co.

83—Underfloor Wire Distribution

Catalog 492 describes Cope Headerduct, a modern method of underfloor wire distribution specially designed for coordination with cellular construction. Drawings show general assembly, blank headerduct, duct with handhole access unit, and capped opening duct. Headerduct accessories are pictured and described.

T. J. Cope, Div. of Rome Cable Corp.

84—Squirrel Cage Induction Motors

Bulletin 201 covers Ideal Type "AP" squirrel cage induction motors rated from 25 to 1500 rpm and 514 to 1800 rpm designed for centrifugal blower, compressor, and pump applications. Complete performance data, emphasizing operating characteristics and construction features. Includes typical installation data.

Ideal Electric & Mfg. Co.

85—Industrial Capacitors

Booklet B-7642 contains 12 pages of easy-to-digest descriptive information on Westinghouse capacitors, power factor correction and selection and application. This booklet can be of value in explaining the uses for capacitors to a client as well as an aid to selection and specification work.

Westinghouse Electric Corp.

86—Magnetic Motor Starters

Bulletin SM-293 covers Square D line of magnetic starters. New 8-page bulletin gives construction features of magnetic starters from NEMA Size O through Size 5, demonstrates installation, inspection and maintenance routines. Also describes field modification kits and variety of enclosures available.

Square D Co.

87—Standby Generator Installation

Bulletin R-235 is a thorough, unbiased analysis of the factors to consider when installing emergency electric generating plants. Intended as a guide to their proper installation, this bulletin points out the more common problems that arise during the planning stage. Analyzes several typical installations.

Onan Div. of Studebaker-Packard Corp.

88—High Voltage Starting Equipment

Manual 6080 describes Allen-Bradley's complete line of high voltage starting equipment. Photographs show complete construction details. Performance ratings in charts and tables. Complete specifications, with prices, on each type of equipment. Modifications and special features. Completely illustrated.

Allen-Bradley Co.

89—Explosion-Proof Fittings

Catalog of aluminum explosion-proof fittings for hazardous locations. Included are junction boxes, conduit bodies, sealing fixtures, plugs and receptacles, pilot lights, switches, and fixtures. Complete dimensional data makes ordering easy. Special fittings made to order. Catalog numbers keyed to separate price list.

Killark Electric Mfg. Co.

90—Outdoor Air Switch

Bulletin 1240-2A describes I-T-E's TTR-6, a vertical opening, group operated, outdoor air switch. This all-new aluminum switch has been designed for weight reduction, and to maintain electrical and mechanical characteristics. Cutaway shows construction. Electrical, mechanical properties in tabular form.

I-T-E Circuit Breaker Co.

91—Preinsulated Splicing

Bulletin 2002-A-9160 features easier, quicker, surer splicing with Buchanan pre-insulated splice caps. The four-page brochure describes the Buchanan wide-range 2002 Splice Cap, ratchet-controlled P50 and C50 tri-*SURE*-tools and the exclusive three-indent rolling action crimp. Lists representatives.

Buchanan Electrical Products Corp.

92—Distribution Centers

Bulletin GEA-6928 describes GE's dry-type integral distribution centers featuring QHT transformers for applications up to 5000 volts. Installation instructions, features, dimensions and cable space, selection data, ratings, and panelboard components are included. Material specification form helps you specify.

General Electric Co.

ELECTRICAL APPARATUS *continued*

93—Quiet AC Switches

Bulletin 327-G1371 describes the complete *Quiette* switch line by Arrow-Hart. Cutaways show construction and operation. Choosing the right switch is easy with the Quick-Selection chart. Included is information, ratings, and wiring diagrams on new models and special purpose switches. Completely illustrated.

Arrow-Hart & Hegeman Electric Co.

94—Enclosed Polyphase Motors

Bulletin MU-230 describes and illustrates tube-ventilated, totally-enclosed polyphase motors in 250 through 500 horsepower ratings. Explosion-proof models are available for Class I, Group C or D, or for Class II, Groups E, F, and G locations. Built in 2 through 12 pole ratings for all standard voltages.

Wagner Electric Corp.

95—Basic Electrical Protection

Booklet PBP, just released by the makers of Buss fuses, covers basic definitions in the area of electrical protection in addition to giving valuable information on motor protection, system selectivity to faults, fuse application, and fuse selection. Charts show time of opening and current limitation.

Bussmann Mfg. Div., McGraw-Edison Co.

96—Distribution Load Break Switch

Bulletin 8C describes Kearny's ARI-60 interrupter switch featuring ARC-KO interrupter unit for high speed, dependable, and repeatedly circuit interruption. Photographs show operation and components. Cutaway details construction. Results of performance tests included, as well as ratings and dimensions.

James R. Kearney Corp.

97—Power Converter

Bulletin 305 describes System Analyzer's Type MM, Multi-Motor, Add-A-Phase power converter. Operates any number of 3-phase motors from single phase. Typical applications are listed. Photographs are shown of installations. Lists models available and gives specifications.

Add-A-Phase Division
System Analyzer Corp.

98—Transformers and Substations

Bulletin 960 describes engineering and installation advantages of Sorgel dry-type load center transformers and substations. Includes 15-point checklist in specifying transformer and substation gear. Equipment up to 10,000 kva and for all voltages up to 15,000. Photographs, cutaways, performance curves.

Sorgel Electric Co.

99—Electrical Fittings

Loose-leaf catalog 135 has been prepared to provide all the technical information you need to select the right conduit fittings, cable terminators, cast iron boxes, and solderless connectors for each of your electrical installations. It includes a comprehensive index and a section of useful engineering data.

O. Z. Electrical Mfg. Co.

100—Interrupter Switches

Bulletin 1630A describes and illustrates arc chute type interrupter switches, fused and unfused, for switching feeder circuits. Photographs show construction and operation. Switch rating chart includes voltage and current ratings, also interrupter life. Assembly forms diagrammed. Sales offices listed.

I-T-E Circuit Breaker Co.

101—Compact Substations

Consultants interested in a new concept for distribution systems will find bulletin 61B9756 an important reference. New *REGU/TRAN* compact substation requires 25% less space than conventional substations resulting in lower installation costs. Describes and illustrates *REGU/TRAN's* many features.

Allis-Chalmers.

102—Contactor Wiring Diagrams

New 40-page Bulletin SM-304 contains 150 diagrams covering various wiring arrangements of Square D contactors, starters, relays, and other devices. Bulletin also includes companion schematic diagrams plus diagrams for typical control circuits. Standard elementary wiring diagram symbols are provided.

Square D Co.

103—Transformer Maintenance Manual

Manual T2RA is a guide to operation and maintenance of Hevi-Duty dry type transformers. Installation procedures cover location, inspection, handling, and grounding. Storage, maintenance, and operation detailed. Includes charts and photographs. Indications and causes of transformer failure are listed.

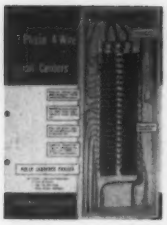
Hevi-Duty Electric Co.

104—Dry-Type Transformer Guide

Bulletin GEA-6907 is a specifiers' guide giving complete information on dry-type transformers, including data on how to select and apply; sound levels and construction features; application and ordering information. Described are general purpose transformers, autotransformers, buck-and-boost, stabilizing transformers.

General Electric Co.

ELECTRICAL APPARATUS *continued*



105—Twin Load Centers

Bulletin GEA-7076 gives application and selection data for new rugged, low cost, industrial and commercial load centers. Complete line U/L listed, 12-42 circuits, 125-150-200 amps. Fully sequence phased for total versatility with *Twin*, 1-, 2-, or 3-pole breakers.

General Electric Co.
Circuit Protective Devices Dept.

106—AC and DC Relays

Relay Catalog 57-S4 provides complete information, with prices, on magnetically and mechanically held ac and dc relays. Included are 10 and 25 ampere relays, normally open and normally closed special relays, reverse current, time delay, close differential, electronic, and current type welding relays.

Automatic Switch Co.,

107—Super Service Mining Cables

Bulletin PP-5-61 describes mining cables with *Supertuf* jacket manufactured by the General Cable Corporation. Various types of cables are illustrated to show construction and complete specifications are given. In addition other General Cable products for mining use are pictured. Includes list of sales offices.

General Cable Corp.

108—Power Switching Centers

Bulletin F-1700D describes construction, standard assemblies and standard components for power switchgear with fused and unfused interrupter switches. Details of operation fully illustrated. Switch rating chart in standardized PSC arrangements gives voltage and current ratings and interrupting life.

I-T-E Circuit Breaker Co.

109—Wiring Devices Catalog

Catalog 60 is a 196 page loose-leaf catalog of electrical wiring devices. All devices are described and illustrated. Necessary dimensional data given. Indexed alphabetically and numerically. List of comparative catalog numbers as to use. Schedule of list prices will be found in back of catalog.

Leviton Manufacturing Co., Inc.

110—Wiring Devices and Fuses

This six page bulletin lists federal specifications with which Eagle wiring devices and fuses comply. Conveniently listed as to style number, type number. Covers Federal Specifications numbers WC-596, WL-142, WR-151a, WR-00151b, WF-791b, WF-803A, WS-890, WS-893a, WS-896a, and MIL-F-15160c.

Eagle Electric Manufacturing Co., Inc.

111—Metal-Clad Switchgear

Bulletin 18S7863 contains valuable information for Consultant planning which includes switchgear equipment. Detailed information on outstanding features are included along with numerous photographic illustrations, sectional drawings, and operation-sequence photographs. Complete specifications and data.

Allis-Chalmers.

112—Packaged Unit Substations

New Bulletin SD-137 describes Square D *Power-Zone* package unit substations, available with capacities to 500 kva, primary voltages to 4800 volts and secondaries to 60 volts. Bulletin explains advantages of Square D design, illustrates features, and lists the many accessory devices available.

Square D Co.

113—Circuit Breaker Panelboards

Bulletin SD-126 defines panelboard quality requirements, describes complete line of Square D circuit breaker panelboard types and applications. Functional requirements of different voltage systems as well as special features are discussed. Selection tables for both panelboards and circuit breakers included.

Square D Co.

114—Electrical Wiring Devices

Catalog 60, 90 illustrated pages, describes complete range of P&S electrical wiring devices, Despard interchangable or conventional and every type of switch, fixture and device. Dozens of items new for 1961, 15 page index and price list also included in this catalog. All products are illustrated.

Pass & Seymour, Inc.

115—Voltage Monitering

Descriptive bulletin 745 covers S&C potential devices for low cost voltage monitoring through 161 kv. It includes details on application, construction, and operation, as well as outline and circuit diagrams. Specification page lists available ratings, styles, dimensions, and accessories.

S&C Electric Co.

116—Constant Current Transformers

Bulletin SL-703 describes Moloney's constant current transformers. Valuable to engineers planning lighting circuits under varying conditions of loading, primary voltage, and frequency. Table of lamp capacities, connection diagram, power factor and efficiency chart. Typical regulation curves shown.

Moloney Electric Co.

ELECTRICAL APPARATUS *continued*

117—Secondary Substations

Bulletin 3104-1A supplies detailed information on secondary unit substations, complete and compact load distribution centers for indoor or outdoor application. Gives data and specifications on a large variety of primary devices, transformers, and secondary switchgear offered in I-T-E secondary substations.

I-T-E Circuit Breaker Co.

118—Ready Reference Wiring Catalog

Compact 64-page catalog is a convenient reference for consulting engineers in the selection of wiring devices. Itemizes over 600 wiring devices including residential, intermediate and specification grades. Listings include the *Hi-Lo* dimmer for 2-stage lighting and the new *Hi-Lux* ultra compact rotary dimmer.

Slater Electric & Mfg. Co., Inc.

119—Integral Unit Substations

GEA-7222 details expanded range of integral distribution centers rated 2500 kva and below liquid and dry types, including 4 incoming sections, 3 transformer sections, and choice of low-voltage equipment. Includes full description, installation details, weights, dimensions, photographs, charts, and drawings.

General Electric Co.

120—Cables for Power Circuits

Bulletin 1037 describes Simplex *Anhydroprene XX* cables for power circuits up to 600 volts, designed for service in ducts or conduits or as open wiring in buildings. The jacket is a balanced compound of neoprene and other ingredients which provides balanced resistance to sunlight, oil, acids, heat, flame, abrasion.

Simplex Wire & Cable Co.

121—Packaged Generators

Bulletin 2100-PRD-202 is an informative booklet on packaged generators. It explains how Electric Machinery's packaged generator with built-in automatic voltage regulator works. Includes mountings and drives and electrical information. Information for generator selection, and tables for figuring wire sizes.

Electric Machinery Mfg. Co.

122—Conduits, Hazardous Locations

Bulletin 2722 "Condulets and the National Electrical Code" details applications of condulets in hazardous locations. More than 300 product and installation photographs. Drawings accompany the Code quotes. A valuable reference for planning electrical installations in hazardous locations.

Crouse-Hinds Co.

123—Insulated Wire and Cable

Everything needed for the selection, design, installation, and operation of Kerite insulated wire and cable for light, power, and control service. Leatherette portfolio is tab-indexed to cover cable description, capacity, testing, technical tables, terminals, splices, and miscellaneous data of value to the consulting engineer.

Kerite Co.

124—Pressure Contact Switches

Square D *Bolt-Loc* switches, designed primarily for heavy-duty service entrance applications, are described in Bulletin SD-136. Bulletin also explains other applications, provides performance test results, and dimensions. *Bolt-Loc* switches are available in ratings from 1200 to 4000 amperes, 240 to 600 volts.

Square D Co.

125—Saturable Reactors

Bulletin 658 describes Sorgel's saturable reactors, to regulate and control electric power for various manufacturing processes. Reactors from 15 kva to 470 kva are pictured. Typical single phase reactor circuit shown. Enclosed is a sheet listing required information for quotation on saturable reactors.

Sorgel Electric Co.

126—Super-Seal Motors

Many outstanding features of A-C's complete line of *Super-Seal* motors are described in detail in this colorfully illustrated bulletin 05-51B9040B. It also contains numerous cutaway drawings and photographs that clearly illustrate advantages of *Poxeal* and *Silco-Flex* motors available for many industrial applications.

Allis-Chalmers.

127—Fuse-Fuseholder

New Buss fuse-fuseholder combination for protection of individual fluorescent fixtures and other equipment on circuits of 300 volts or less. Bulletin SFH-6 tells how individual fusing reduces hazards of fires and explosions. Bulletin specifies the size fuse to use and where to locate it for the best protection.

Bussmann Mfg. Div., McGraw-Edison Co.

128—High Voltage Power Cables

Bulletin RCP-7001 describes *Rozone* and *Rozone A* insulated high voltage power cables. Bulletin contains advantages, specifications, ratings, scope, conductors, and shielding. *Rozone* and *Rozone A* insulations are described. Tables show proper insulation and jacket thicknesses for various applications. Illustrated.

Rome Cable Division of Alcoa.

ELECTRICAL APPARATUS *continued*

129—Low Voltage Circuit Breakers

Bulletin describes Mears' air and fused circuit breakers of 600 through 4,000 ampere frame sizes. These breakers are electrically or manually operated, and offered in fixed switchboard, plug-in, and drawout mountings. Includes, prices, dimensions, weights, modifications, and application tables and charts.

Mears Controls, Inc.

130—Panelboard Circuit Breakers

Bulletin 3103 covers the Heinemann series 0911, an economical panelboard circuit breaker dimensionally interchangeable with other makes. Available in 1- and 2-pole models, 0.050 to 60 amperes, the 0911 uses hydraulic-magnetic actuation to end heat-induced nuisance tripping. Fast short-circuit interruption.

Heinemann Electric Co.

131—Motor Starter Manual

Manual 6100 describes Allen-Bradley's new and improved line of combination starters, reversing starters, multi-speed starters, and contactors. Photographs show construction and components. Complete dimensions on all equipment. Includes data on ratings, enclosures, overload protection, and controls.

Allen-Bradley Co.

132—Underfloor Duct Systems

Catalog 517 describes Cope systems for power, telephone, and intercom wiring distribution. Includes the latest design Cope service fittings. Detailed diagrams show standard duct and double capacity duct. Junction boxes and accessories, as well as floor plans and service fittings are pictured. Installation photographs.

T. J. Cope, Div. of Rome Cable Corp.

133—Low Speed AC Generators

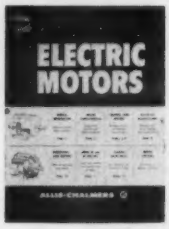
Bulletin 510 describes Ideal's low speed engine-type ac generators rated from 10 to 10,000 kva at 80 to 450 rpm. Construction features are outlined and illustrated. Typical installations pictured. Advantages are listed. Special applications. Map shows locations of representatives and service facilities.

Ideal Electric & Mfg. Co.

134—Air-Over Motors

Bulletin MU-250 points out economies through the use of air-over motors for driving propeller or axial flow fans. These motors are mounted in the air stream of fans and their best performance is obtained at recomended air velocity in feet per minute. Available in 1 through 10 hp four-pole ratings.

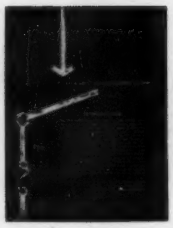
Wagner Electric Corp.



135—Electric Motors

Consultants will find this a handy reference to help select the motor best suited to a particular drive. This catalog 51C6052Y contains a complete line of polyphase squirrel-cage and wound-rotor induction motors for every industrial use. Includes synchronous and *Synduction* motors to meet many applications.

Allis-Chalmers.



136—Service-Entrance Equipment

Bulletin 601 deals with operating and safety requirements for service-entrance units. Covers manual operation, short-circuit and overload protection, arcing and single phasing. Gives equipment specifications. Includes illustrated section on operation of Pringle bolted-pressure load-break service-entrance switch.

Pringle Electrical Manufacturing Co.

137—Liquid Filled Transformers

Bulletin GEA-6832A describes distribution equipment transformers rated 112½ to 2500 kva, oil or *Pyranol*® filled, for conventional or unit substations. Outlines construction details, standard tests, accessories, and switches. Includes tables and diagrams giving electrical and mechanical characteristics.

General Electric Co.

138—Remote Control Motor Generators

Bulletin 5047-1A deals with I-T-E's exclusive *Telemand* motor operator for remote control of molded case circuit breakers. The device is a foolproof, compact and economical unit for opening, closing or resetting molded case circuit breakers by remote control. Will fit any I-T-E breaker in J-frame size or larger.

I-T-E Circuit Breaker Co.

139—Bus Duct

A series of bulletins covering technical descriptions, ratings, dimension, test data, protective devices, and hangers. Bulletins 30-660-1-2-3-4 cover bus duct, plug-in bus duct, low impedance bus duct, high impedance bus duct, and electric utility bus duct. Illustrated with construction drawings and diagrams.

Westinghouse Electric Corp.

140—Protective Fuses

Bulletin HCS tells how Buss *Hi-Cap* fuses have unlimited interrupting capacity on any voltage up to 600 to provide safe protection for loads above 600 and up to 5000 amperes. Describes operating characteristics and advantages, illustrates dimensions, contains charts on current limiting effect and opening times.

Bussmann Mfg. Div., McGraw-Edison Co.

ELECTRICAL APPARATUS *continued*

141—Grounding Facts Booklet

Latest facts on National Electric Code requirements. Picturing and describing typical 15 amp, 125 volt; 20 amp, 125 volt; 20 amp, 250 volt and 30 amp, 125/250, 50 amp, 125/250 volt grounding installations. Included is a configuration and voltage chart showing the approved receptacle openings.

Arrow-Hart & Hegeman Electric Co.

142—Electric Generating Plants

Bulletin F-146 describes the complete line of Onan electric plants, including gasoline and diesel models. Lists 45 basic models. Easy-to-read specifications make it simple to select the proper type of generating plant for all needs. Chart of representative models outlines capacity, model, and voltage.

Onan Div. of Studebaker-Packard Corp.

143—Molded Case Circuit Breakers

Bulletin 5040-B reviews fundamentals of short-circuit protection for motor circuits. Includes features and applications of I-T-E molded case breakers, tabulation of instantaneous trip range of I-T-E frame sizes, and suggested trip setting positions for various horsepower motors. Completely illustrated.

I-T-E Circuit Breaker Co.

144—Dry-Type Transformers

Bulletin 200A covers Hevi-Duty's dry type transformers for power and lighting circuits. Tables include output, price, dimensions, net weight, and sound level value. Typical vector and connection diagrams are included. Features are keyed to photograph. Optional equipment is listed. Transformers illustrated.

Hevi-Duty Electric Co.

145—New Compact Switchboards

Bulletin GEA 6734 describes GE's shallow depth, Type DR NEMA Class I and DR NEMA Class II switchboards. Layout and dimensional data given for incoming line and distribution sections. Circuit breaker and fusible switch units for main protective and branch devices.

General Electric Co.
Distribution Assemblies Dept.

146—Switchboard Manual

New Switchboard Manual 2600 gives complete construction features of Square D switchboards including provisions for grounding and fault protection. Application information with typical plant layout suggestions are provided. Also covers the many types of sections available and gives full dimension data.

Square D Co.

147—Sectional Terminal Blocks

Catalog 76 features Buchanan sectional pres-*SURE*-blocks. Catalog includes technical data, engineering specifications, drawings. Shows modular construction, assembly ease, wire grouping, 3 types of contacts. Also covers one-piece terminal blocks, solderless connectors, one-piece squeeze-type connectors.

Buchanan Electrical Products Corp.

148—Aluminum Conduit Fittings

Catalog 59 lists, in condensed form, all types of aluminum conduit fittings made by Killark Electric Mfg. Co. Contains dimensional data of such items as circuit breakers, conduit bodies, connectors, explosion-proof vapor-tight and dust-tight fittings and fixtures. Catalog numbers keyed to separate price list.

Killark Electric Mfg. Co.

149—Terminating Splicing Fittings

"O. Z. Terminating and Splicing Fittings for Interlocked Armor Cable," 36-page engineering bulletin 135A, gives complete specifications, dimensions, cutaway drawings, photographs, and installation instructions. Prices and weights also are given for each item, along with ordering data and available materials.

O. Z. Electrical Mfg. Co.

150—Transformers

Bulletin 61B6186C contains small power, network, instrument, and distribution transformers for industrial and utility application. Each type of transformer is fully described and illustrated in this bulletin stressing some of the outstanding features and various applications. Current and potential transformer sizes.

Allis-Chalmers.

151—Three Phase Converters

Bulletin 245 tells how by using System Analyzer's Add-A-Phase converter you can immediately use 3 phase motors on single phase lines. Types for general purpose, higher torque, air conditioners, or long start applications are available in 1 hp through 30 hp sizes.

Add-A-Phase Division
System Analyzer Corp.

152—Building Wires and Cables

Bulletin B-1-61 has been issued to assist the engineer in the selection of electrical conductors in building construction and modernization. Specifications on building wires and cables, rubber insulated, thermoplastic insulated, nylon jacketed, and fibrous covered. Tables of technical data.

General Cable Corp.

ELECTRICAL APPARATUS *continued*

153—Safety Switches

Bulletin GEA-6756 is a selection guide for complete lines of General Electric light and heavy duty safety switches. Indoor and raintight enclosures. Covers light duty (TG), heavy duty (TH), and heavy duty interrupter (THD) devices. Lists ratings, knockouts, and dimensions.

General Electric Co.
Circuit Protective Devices Dept.

154—Electrical Wiring Devices

Catalog 1101, Section 1, lists items for use in industrial and commercial wiring. All devices are described and illustrated. Complete information including packing weights and prices given. Indexed alphabetically and numerically. This is a ready reference catalog prepared especially for engineers and estimators.

Leviton Manufacturing Co., Inc.

155—Comparative Catalog Numbers

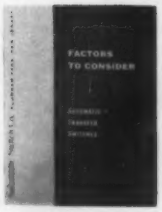
This 12 page bulletin is a speed-check list of comparative catalog numbers, listing the most commonly used wiring devices by manufacturers name. Devices of like function, manufactured by Eagle Electric Manufacturing Co., are cross referenced to Eagle catalog numbers. This is convenient for daily use.

Eagle Electric Manufacturing Co., Inc.

156—Load Tap Changing Equipment

Bulletin LTC-2907 describes the principles of Moloney load tap changing equipment. External and internal construction and switch mechanism detailed. Types of load tap changing equipment for various applications described. Illustrations have inset wiring diagrams. Sequence chart of operations.

Moloney Electric Co.



157—Automatic Transfer Switches

Bulletin 596 explains the What, Where and Why in the selection and application of automatic transfer switches. Its 24-pages are amply illustrated, provide construction details, tell what is required in an adequately designed automatic transfer switch, and suggest specifications to follow in proper selection.

Automatic Switch Co.

158—Voltage Distribution Systems

Bulletin 249 describes *Power-Flex*, the voltage system for high school laboratories. This system is flexible, complete, safe, compact, rugged, and Underwriters' Laboratories approved. Schematic of typical *Power-Flex* installation. Control center pictured and described. Service outlets and extension cords listed.

Standard Electric Time Co.

159—Dry-Type Transformers

Information on sound ratings, engineering advantages, typical applications, construction details, heat dissipation, insulation, and custom designs included in bulletin 611 on dry-type transformers. Presented in pictorial and chart form, all sizes from ¼ kva to 10,000 kva. Completely illustrated.

Sorgel Electric Co.

160—Rocker-Glo Switches

Illustrated four-page brochure on Rocker Type switches by Pass & Seymour. Standard handles for 15 or 20 Amp 120/277 volts ac. Lighted or pilot light handles for 15 amp 120 volts ac. All have quiet, luminous handles, available in Despard strap or Despard interchangable.

Pass & Seymour, Inc.

161—Metalclad Switchgear

This 36-page brochure describes S&C metalclad switchgear. Application and performance, components, specifications, and accessories are described and illustrated. Photographs and diagrams show how metalclad switchgear is used in industrial distribution systems. Excerpts from 1959 National Electrical Code.

S&C Electric Co.

162—Low Voltage Switchgear

Advanced features of I-T-E's new K-Line circuit breakers and a complete review of new low-voltage power breakers and switchboards are presented in a two-color, 20-page bulletin 3200-1A Description, selection, application, and specifications fully detailed. Equipment illustrated.

I-T-E Circuit Breaker Co.

163—PVC Rigid Conduit

Bulletin KE 1058 is a new 20-page rigid polyvinyl chloride electrical conduit catalog. Included are comprehensive test results, specification information, installation instruction, corrosion resistant charts, and other valuable data. Illustrations show various types of pipe and fittings. Pictures show proper assembly.

Kraloy/Chemtrol Co.

164—Pressure Contact Switches

Bulletin 101 describes Barkelew's *Bolt-Log* load break service entrance switches. Furnished in 1200, 1600, and 2000 amp capacities for 240, 480, and 600 volt 60 cycle ac service. Two, three, and four pole, fused or unfused, front or rear connection. Mountings, construction, dimensions, and tests included.

Barkelew Electric Mfg. Co.

ELECTRICAL APPARATUS *continued*

165—Underfloor Duct Systems

Catalog 203 describes the Orangeburg underfloor duct system, non-metallic underfloor raceways for distribution of electrical wiring in commercial, industrial, and institutional buildings. Drawing keyed to index shows components, which are also pictured and described. Instructions for installation given.

Orangeburg Manufacturing Co., Inc.

166—Bus Duct

Bulletin XL-765 provides technical data, dimensions, catalog information, and layout procedures for BullDog's new plug-in bus duct which exhibits low voltage drop characteristics and has built-in safety features. Also contains dimensions and technical data on X100 bus duct.

BullDog Electric Products Division
I-T-E Circuit Breaker Co.

167—Silicone Insulated Motors

Bulletin 1C-106, "Specify Silicone Insulated Motors and Transformers and Save" describes several ways to save on initial equipment, installation, and maintenance costs. Five ways in which major manufacturers are using silicone insulation systems in improved equipment designs are also reviewed.

Dow Corning Corp.

168—Pump Motors and Drives

Bulletin F-2002 provides condensed specification data, illustrations, cutaways, diagrams, and descriptions of 16 lines of specialized pump motors and gear drives. Illustrated index and descriptive tables make it easy to locate the type of motor, hp, thrust and other facts required to select the drive to fit each need.

U. S. Electrical Motors Inc.

169—Electrical Controls

Bulletin A-17 features automatic transfer switches for instantaneous transfer from normal to emergency source when uninterrupted current is essential, magnetic contactors to control lighting and power circuits when push button or pilot controls are operated, special electromagnetic controls, timing devices.

Zenith Electric Co.

170—New Metalclad Switchgear

New I-T-E 4160-volt stored energy metal-clad switchgear described in bulletin 2801-2A. Newly-designed equipment, smaller in every exterior dimension, offers spring-powered stored energy closing in a completely new metal-clad gear design; provides new convenience and safety. Illustrations and charts.

I-T-E Circuit Breaker Co.

171—Laboratory Electrical Fittings

Engineers' manual E details electrical pedestal fittings for use in laboratories, hospitals and schools, all Underwriters' approved. Also includes conduit, rack box, and flush box fittings. Dimensional drawings give details on pedestal fittings. Condensed descriptions of fittings charted. Complete price list included.

Water Saver Faucet Co.

172—Flexible Lighting Busway

Bulletin GEA 6170A describes GE's LTG 50 ampere-300 volt-2, 3 and 4-pole busway. Shows flexibility as power source for lighting fixture application, including display lighting and small power tools, machines and business equipment. Components, accessories, dimensions.

General Electric Co.
Distribution Assemblies Dept.

173—Sub-Floor Electrical Raceways

Catalog 270 describes Inland's *Cellu-flor,* for future electrical growth, providing continuous parallel raceways every six inches throughout the entire floor area. Shows installation procedures and panel types. Load tables and construction details. Methods of fireproofing described and diagramed.

Inland Steel Products Co.

174—Plunger-Type Mercury Relays

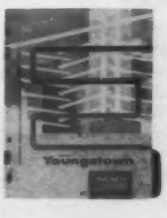
Bulletin 0-20 describes a new design in plunger relays particularly suitable for heavy duty loads such as resistance heating, heat treating furnaces, drying ovens, drying equipment, and welding. Also used for illuminated signs and score boards. Includes features, application, operation and electrical ratings.

Mercoid Corp.

175—Ducted Floors for Electrification

Sixteen-page booklet, "Electrical Outlets Wherever You Need Them," gives complete details on RLC duct floors, a new development which provides 100 percent electrical flexibility for buildings at a remarkably low cost. The illustrated booklet is published by the Concrete Steel Reinforcing Institute.

Concrete Reinforcing Steel Institute.



176—Steel Electrical Raceways

Bulletin SPA-034-461 describes Buckeye and Yoloy steel electrical raceways for modern construction. Various types of conduit are illustrated. Chemical properties are given. Photographs show installation while buildings are under construction. Conform with the requirements of Underwriters Laboratories.

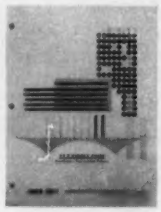
Youngstown Sheet and Tube Co.

ELECTRICAL APPARATUS *continued*

177—Storage Batteries

Bulletin 6487 describes features of *Exide-Tytex* batteries for stationary applications in electric utilities, telephone, emergency light and power, fire alarm, and microwave. Available with positive plates of either patented Silvium or calcium alloys. Table lists electrical capacities and sizes of 16 types.

Exide Industrial Marketing Division.



179—Specification-Type Fixtures

Catalog 131 describes Illumiline specification type lighting fixtures available in five distinct types with a wide variety of housing designs and photometric characteristics. Distribution curve and CU are given for each fixture, as well as dimensions and construction details. Indexed for ready reference.

Marvin Electric Manufacturing Co.

178—Current-Limiting Breakers

New bulletin 4300-1A describes I-T-E's K-Don line of LV current-limiting circuit breakers and switchgear. Bulletin gives complete description, complete selection and application information, dimensions, and guide specifications. Two colors with full photo illustration. Sales offices listed.

I-T-E Circuit Breaker Co.

180—Disconnect Isolators

Bulletins 138 and 140 describe isolators which are extremely compact switching devices for the 5 to 15 kv range. Unique telescoping action requires one third of space needed by equally rated knife-type switches. Included are complete specifications and directions on how to order. Completely illustrated.

James R. Kearney Corp.

ENGINEERS' OFFICE & FIELD EQUIPMENT

181—Table-Top Whiteprinter

Bulletin A-2840 describes the *Starlet*, a table-top white printer made by the Revolute division of the Charles Bruning Company. Has a speed of 55′ per minute, a 20″ printing width, and a lamp choice of 60 or 80 watts per inch. Specifications, electrical requirements, necessary amperage, and dimensions.

Charles Bruning Co., Inc.

184—Data Processing Systems

Describes the outstanding performance characteristics and processing opportunities presented to the engineering and research professions by the new expanded 1620, with storage increased to 60,000 positions and high speed punched card input and output. Component units illustrated.

International Business Machines Corp.

182—Copyflex Prints in Volume

Bulletin A-2831 describes the *Copyflex* Model 61 which delivers an automated cycle of over 3000 8½ x 11″ or over 1500 11 x 17″ copies per hour. Automatically fed and trimmed. Operations described and pictured. Specifications include electrical requirements, lamp and transformer, dimensions, weight.

Charles Bruning Co. Inc.

185—Solid-State Processing System

Booklet serves as a brief, compact introduction to the 7074 solid-state data processing system. Topics covered include modularity, speeds, and program compatibility with the 7070. Fast and economical. A list of programs available from the 7074/7070 programming library is also included.

International Business Machines Corp.

183—Portable Microfilmer

Bulletin A-948 describes the new Recordak portable microfilmer. Illustrated in full color, this six page folder explains and illustrates the outstanding features. This portable microfilmer weighs less than an office typewriter, 24 lbs, and measures 6½″ x 15½″ x 12½″. Fits compactly into a handy carrying case.

Recordak Corp.

186—Microfilming Systems

A presentation of modern microfilming in booklet form by Recordak, the originator of modern microfilming. Explains the system in precise form. Show sample films of the various steps in recording a specific engineering drawing. Finally reproductions of the film printed on opaque and translucent vellum stock.

Recordak Corp.

FIRE PROTECTION EQUIPMENT

187—Fire Alarm Systems

Catalog F249 comprises several bulletins in a binder completely describing *Flexalarm*, Gamewell's fire alarm systems. Bulletin F249A describes and illustrates the systems components; F249C gives complete specifications and circuit diagrams; 131 and 132 detail local fire alarm control cabinets. Special systems.

Gamewell Co.

188—Vertical Fire Pumps

Bulletin 401 describes in detail Layne vertical fire pumps especially designed to pump from wells, reservoirs, lakes, rivers, or sumps. Multi-colored diagrams show operation of water and oil lubricated pumps. Sizes and capacities are charted. Fire pump accessories are diagramed in their proper assembly position.

Layne & Bowler, Inc.

189—Fire Hydrants

An AWWA compression type, dry head fire hydrant with swivel flange below nozzles, permitting nozzle section to be rotated 360° without removing bolts. Furnished with or without breakable flange and stem coupling. All parts removable thru inside of barrel. Bell, mechanical joint or flange pipe connections.

R. D. Wood Co.

190—School Fire Alarm Systems

Bulletin A-3-1158 describes Autocall's Type SA fire Alarm system for better school protection. Combines many safety features to insure continuous, self-supervised operation, and flexibility to incorporate fire detection devices. Open control panel shows construction. Schematic wiring diagram. List of representatives.

Autocall Co.

191—Fire and Watch Stations

Bulletin PR 16 describes Autocall's Type TFW telephone fire and watch station for effective patrol supervision, fire alarm signalling and emergency reporting. Includes models available, construction features, operation, and dimensional drawings. Photographs show unit in open and closed positions.

Autocall Co.

192—Aluminized Asbestos Cloth

A fact-file describes Keasbey & Mattison's *Kamklad*, a new aluminized cloth principally used for fire entry suits and fire safety suits. Physical properties are given in detail, and other uses for this new material are cited. Specifications are included. Photograph illustrates product in use as a fire entry suit.

Keasbey & Mattison Co.

HEAT EXCHANGERS & WATER HEATERS

193—Heat Exchanger Tubes

Anaconda bulletin DM 6104 describes mechanical and physical properties and test results of new *Cupro Nickel* alloy specially developed for heat exchanger tubes in power plant feedwater heaters. This high-strength copper-nickel-iron tube alloy makes possible substantial operating economies. Sales offices listed.

Anaconda Co.

194—Heat Exchanger Manual

This catalog contains an engineering section that provides the engineer with the means to make size estimates of heat transfer equipment. It helps the engineer to select a heat exchanger that will provide economy of service, precise operation, and long life. Contains thermal standards and reference data.

Condenser Service & Engrg. Co., Inc.

195—Water Heating Guide

Concerned with the problem of furnishing hot water for large buildings? Write for a copy of booklet TH-160 on indirect type instantaneous water heaters, their application, selection, and installation. Indirect type water heaters obtain heat from the same hot water or steam boiler that furnishes heat for the building.

Bell & Gossett Co.

196—Packaged Boiler-Burner Units

Bulletin describes packaged, vertical boiler/burner units for hot water supply or hot water heating. Available in 7 sizes, from 80,000 to 525,000 Btu/hr. Storage capacities from 22 to 123 gal, Oil and/or gas fired. Line drawings show construction and components. Complete dimensions and specifications in tabular form.

S. T. Johnson Co.

HEAT EXCHANGERS & WATER HEATERS *continued*

197—Platecoil Technical Data Manual

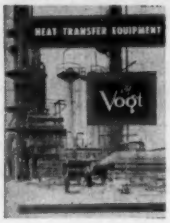
Bulletin 159, 48 pages, completely describes new *Multi-Zone Platecoil*, covering styles, dimensions, specifications, and operational data. Methods of calculating heat transfer equipment requirements are outlined. Typical installations are pictured and described. Available on request.

Tranter Manufacturing Inc.

198—Custom-Formed Platecoil

New bulletin describing *Platecoil* heat transfer equipment built to specific application requirements. Shows how basic *Platecoil* can be formed and fabricated to meet special heating and cooling requirements with respect to size, shape, capacity, pressure containment, and materials of construction.

Platecoil Div., Tranter Mfg., inc.



199—Heat Transfer Equipment

Bulletin HE-8 describes the wide range of heat transfer equipment built by Vogt. Standard and custom built types from steel, alloys, or nonferrous materials for every temperature, pressure, or vacuum service. Conforms to all codes. Features of design shown for each type of heat exchanger. Fully illustrated.

Henry Vogt Machine Co.

To order copies of the bulletins, please fill out the card between pages 2 and 3 or 58 and 59.

HEATING & VENTILATING EQUIPMENT

200—Ready-To-Run Fan Sets

Catalog 517 describes a new line of V-belt driven *Ready Units*. Features of construction and available special features are outlined. Selector charts indicating volumes to 25,000 cfm and static pressures to 2½ in. are shown in charts and graphs. Dimensions, capacities, shipping weights, and motor limits included.

Clarage Fan Co.

203—Air Moving Equipment

Twelve page catalog contains complete information on Wausau air mover for various applications. The catalog is illustrated with features of construction, especially describing low silhouette and its modern design. It also contains dimension data, specifications, and electrical characteristics.

Greenheck Fan & Ventilator Corp.

201—Roof Ventilators

Illustrated bulletin DR-761 gives details of new DeBothezat *Power-Flow* Ventilator. Entire motor and fan unit tilts back above roof level to allow fast, easy inspection. Fan wheel diameters from 12" to 48". Capacities up to 43,070 cfm vertical discharge fans are available for removing oil and dust laden air.

DeBothezat Fans

204—Extruded Aluminum Air Diffusers

Catalog EAG-59 gives full details on this complete, quality line of extruded aluminum grilles, registers, matched linear diffusers, outside louvers and louver penthouses. Pictures all types and models and gives complete descriptions, including louver and border designs, sizes and finishes. Illustrated.

Titus Manufacturing Corp.

202—Perimeter Electric Heating

Bulletin E-30-1 describes Nesbitt's *Sillline*, electric perimeter heating system. Exploded view shows components and arrangement. Complete dimensions of components and accessories and details on capacities are given. Schematic diagrams show unit and control wiring. Specifications include installation data.

John J. Nesbitt, Inc.

205—Heat for Modern Buildings

Bulletin HY-F237 describes the operating principle and step-firing control of the all cast-iron gas fired *Multi-Temp* hot water boilers used to heat office buildings, institutional buildings and apartment houses. Diagrams show how *Multi-Temp* operates and is controlled. Actual installation shown in photographs.

Hydrotherm, Inc.

HEATING & VENTILATING EQUIPMENT *continued*

206—Surface Unit Heaters

Catalog 956 describes *Grid* cast iron steam heat transfer surface unit heaters, blast heaters, and radiators. Describes and illustrates one-piece construction. Included are air distribution charts, heating capacities, conversion tables, and specifications. This four-section catalog with tab index is well illustrated.

D. J. Murray Manufacturing Co.

207—Direct-Connected Vaneaxial Fans

Bulletin 475 covers new Aerovent direct-connected vaneaxial fans, equipped with removable vane sections to facilitate installation and simplify routine cleaning and maintenance. Furnished in sizes 18" to 48" for capacities to 67,300 cfm, these high-efficiency units offer top performance against resistances to 6" SP.

Aerovent Fan Co., Inc.

208—Air Handling Units

Bulletin 6011C describes compact line of air handling units. Contains valuable engineering section including methods of coil selection, typical design problems and example, as well as basic engineering information on air conditioning and heating fan capacities. Coil ratings and complete dimensional data are included.

Dunham-Bush, Inc.

209—Heating-Ventilating Cabinets

Bulletin UH-130 gives complete description on heating and/or ventilating cabinets. Type HV is for both heating and ventilating in horizontal or vertical operation. Type V is for ventilating only. Information includes unit arrangements, physical data, weights, fan performance, dimensions, and coil ratings.

Buffalo Forge Co.

210—Gas Firing for Heating Boilers

Bulletin B-8 describes Webster's *Kinetic* gas burner. Complete information, with examples, tells how to determine the required burner size. Charts of capacity and dimensions. Selection of controls is covered in detail. Cutaway shows installation. Tabulated charts show capacities and pressure losses.

Webster Engineering Co.

211—Air Diffusers

Bulletin K27-A illustrates and describes linear and rectangular series air diffusers. Offered in three series — square, panel, long-slotted — units combine best air distribution and modern styling. Dimensional drawings for several types in each series provided. Complete selection and performance data, list of agents.

Connor Engineering Corp.

212—Auditorium Unit Ventilator Data

Bulletin 650-E1A is a very informative application manual of auditorium unit ventilators. Components described and illustrated. Selection procedures include tables of fan capacities, coil data, steam conversion factors, steam heating and hot water capacities, arrangements and complete dimensional data.

American Air Filter Co., Inc.

213—High Velocity Air Duct

Catalog describes uses and applications of spiral pipe and welded fittings for air handling. Information on construction, lengths, diameters, material, and specifications included. Various advantages listed. Complete data on United sound absorbers. Diagrams show standard, low loss, and accessory fittings.

United Sheet Metal Co., Inc.

214—Centrifugal Fans

New Bulletin 70 contains complete information on Marlo centrifugal fans, available in 12 sizes from 8¾" to 32¾" diameter, circulating from 400 to 46,000 cfm AMCA certified ratings. The 16-page booklet includes construction details, plus performance tables and dimensional data on all 12 sizes of fans.

Marlo Coil Co.

215—Radiant Panel Heating

"Radiant Panel Heating with Steel Pipe," 48 pages, covers the history of this type of heating, basic design, floor, ceiling, and wall panels, information on snow melting systems, pipe coil integration, design of a floor coil system, and a boiler hook-up diagram.

Committee of Steel Pipe Producers, American Iron and Steel Institute.

216—Heat Pump

Bulletin L165.05-AD3 describes the York heat pump for large installations. Suitable for office buildings, large stores, and factories. For heating in the winter and cooling in the summer. Four basic systems are explained. Principle of heat pump detailed. Engineering details on typical installations.

York Corp., Sub. of Borg-Warner Corp.

217—Gravity Ventilator Slide Rule

The *Gravity Ventalog* helps the engineer to properly size gravity roof ventilators and extruded aluminum louvre houses. All working information for rapid and accurate sizing of units, is integrated and is equivalent to six capacity tables, five pages of charts and ten math formulas.

Penn Ventilator Co., Inc.

HEATING & VENTILATING EQUIPMENT *continued*

218—Airfoil Centrifugal Fans

Catalog 1123 describes Westinghouse's *Centriline*, Series 200, airfoil centrifugal fan with in-line air flow. Advantages and applications are outlined. Includes arrangements, sound comparison curves, and performance curves. Illustrations include cutaway showing construction features. Complete engineering data.

Westinghouse Electric Corp.

219—Rehabilitating Heating Lines

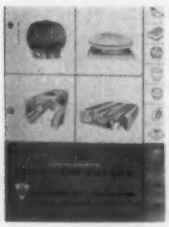
Descriptive brochure illustrating procedures for restoring existing underground heat distribution systems to new construction efficiency. Before and after illustrations show metal conduit, split tile, concrete box, and hydrocarbon fill along with restoring procedures. List of rehabilitation jobs given.

Concrete Thermal Casings, Inc.

220—Belt-Driven Tubeaxial Fans

Bulletin 625, eight pages, describes Type BT and BTV tubeaxial fans in 30 to 60 inch sizes. Designed for handling high temperatures, corrosive and explosive fumes, abrasive dusts, dirt laden air, high humidity. Also lists general fan laws, data on system and open surface tank ventilation, and duct resistance.

Robbins & Myers, Inc., Propellair Div.



221—Low Silhouette Roof Ventilators

Catalog, 1961 edition, describes complete line of high efficiency gravity and power roof ventilators. Complete engineering and performance data cover rotary, stationary, directional, continuous ridge, and unit ventilators in the gravity series. Powered models include horizontal and vertical discharge types.

Western Engineering & Mfg. Co.

222—Cast Iron Boilers

Catalog H-254 describes Weil-McLain's commercial and industrial gas, oil and combination gas/oil boilers. Net gas ratings to 3354 mbh (129.1 hp), net oil ratings to 2942 mbh (113.2 hp); ratings approved by Institute of Boiler & Radiator Manufacturers. Contains description, ratings, dimensions, and drawings.

Weil-McLain Co.

223—Duct Fans

Illustrated bulletin DB-761 describes DeBothezat *Bifurcator®* fan with patented removable cone. Half-section of cone comes off as *Bifurcator®* remains in duct. Motor and fan assembly slides out on rails for quick inspection. Ideal for fume removal and induced draft. *Bifurcator®* installs like a section of ductwork.

DeBothezat Fans

224—Certified Performance Ratings

Bulletin 261A is an offical directory of products licensed to carry the AMCA Certified Ratings Seal and published by the Air Moving & Conditioning Association, Inc. Contains essential product identification data on more than 5000 centrifugal, axial and propeller fans, and power roof ventilators.

Air Moving & Conditioning Ass'n Inc.

225—Ventalog cfm Calculator

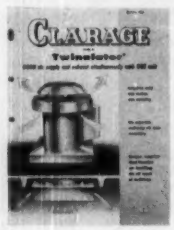
The *Ventalog* is a working tool to aid engineers in calculating the proper cfm requirement for any room area. In seconds, the *Ventalog* finds the cubic area of a room. Using the suggested rate of air change chart, the cfm is quickly calculated. An excellent companion piece for the Penn catalog.

Penn Ventilator Co. Inc.

226—Industrial Fans

Bulletin L-5 describes Lehigh's line of industrial fans. Includes tables, specifications, photographs, and drawings. Rating tables show air volumes, rpm, hp at static pressures, and outlet velocity and velocity pressures. Also correction ratios and fan laws.

Lehigh Fan & Blower Division, Fuller Company.



227—Air Supply And Exhaust Units

Bulletin 552 describes Clarage's *Twinalator*. Both air supply and exhaust are handled simultaneously with one impeller. Requires only one motor, one roof opening, one drive, one starter. No separate make-up air unit necessary. Dimensions, capacity tables, and diagrams included. Installations shown.

Clarage Fan Co.

228—Roof Exhausters

Catalog SL 1-60 illustrates and describes the *Spun Line* of centrifugal roof exhausters, for either sidewall or direct drive mounting. Describes unit construction, heavy wall tubing structure welded into a rigid one piece frame, spun aluminum housings, and weather shielded vibration isolations. Specifications.

Greenheck Fan & Ventilator Corp.

229—Heating-Cabinet Package

Bulletin 31-2 describes Nesbitt's *Sill-line* perimeter radiation heating and cabinet combination. Illustrates cabinets available to tie in with heating units. Cutaway shows construction, and *Sill-line* heating principle is explained. Capacity tables, details, and dimensions. Engineering data on steam and hot water systems.

John J. Nesbitt, Inc.

HEAT EXCHANGERS & WATER HEATERS *continued*

230—Church Heating

Bulletin HY-F238, entitled "Good Church Heating," summarizes the considerations in selecting the proper heating medium for churches. Describes the true input modulation feature of *Multi-Temp* boilers which saves fuel dollars and assures maximum heating performance. Pictures of installations.

Hydrotherm, Inc.

231—Oil Burner Chimney Guide

Engineering data guide, EM-306, gives simplified calculation procedure for selecting chimney sizes for I.B.R. approved cast iron boilers. Included are sample problems, calculation procedures for multiple boiler installations, information on special conditions, and general recommendations.

Weil-McLain Co.

232—Compact Centrifugal Ventilators

Bulletin CV61 describes and illustrates new high performance advanced styled, low silhouette, centrifugal roof ventilators featuring aerodynamically designed extruded aluminum discharge vanes, quietness of operation, non-overloading horsepower, and a stable pressure curve. Capacities certified by AMCA.

Western Engineering & Mfg. Co.

233—Power Roof Ventilators

Bulletin 680-C describes *Sky-Blast* power roof ventilators. Weatherproof features include corrosion-proof, aluminum alloy propeller; nonclogging dampers and rain-shed; one-piece all welded base hot-dip galvanized after fabrication. Automatic fire-vent release. Sizes to 60 inches; air deliveries to 78,000 cfm.

Robbins & Myers, Inc.

234—"Z" crete Insulating Conduit

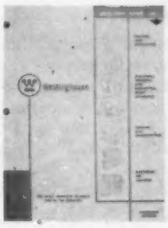
Design Data Booklet C-6 describes the features of permanent thermal efficiency for underground heat distribution piping using *"Z" crete* and Insulating concrete conduit. Includes construction sequence with diagrams, load study, typical conduit diagrams. Many other details are included.

Concrete Thermal Casings, Inc.

235—Air Moving Device Test Code

Bulletin 210 explains the Standard Test Code for Moving Devices, issued by the Air Moving and Conditioning Association Inc. Covers scope, definitions, test setup and equipment, observations, calculations, and results. Includes tables, charts, graphs, and schematics. The purpose and major association activities outlined.

Air Moving and Conditioning Ass'n Inc.



236—Air Handling Equipment

Bulletin B-5216 is a selection guide for Westinghouse's complete line of air handling equipment. Covers heating, ventilating, mechanical draft, cooling, dehumidifying, and electronic air cleaning. Each product is illustrated, some with cutaways, and gives short description together with catalog number.

Westinghouse Electric Corp.

237—Ceiling Diffusers

Catalog CD-61 pictures and describes this complete line of round, half-round and square ceiling diffusers and full line of accessories. Comprehensive engineering data, selection data and air flow measurement sections of catalog make it easy to accurately select correct diffuser for any application.

Titus Manufacturing Corp.

HIGHWAY, BRIDGE & STREET MATERIALS

238—Pavement Inspector's Manual

Bulletin R1-2-3, published by Portland Cement Association, is a manual for the concrete pavement inspector. Gives information and formulas for the inspector on the grade, at the plant, and at the paver. Also contains data on hot and cold weather construction, as well as a complete check list. Well illustrated.

Portland Cement Association.

239—Concrete Tensioning Materials

Catalog PC-936 shows sizes, weights, strengths, and typical load-elongation curve of uncoated stress-relieved strand for pretensioned bonded prestressed concrete. Properties of galvanized strand and uncoated stress-relieved wire for post-tensioned design are listed. End fittings, bearing plates are illustrated.

John A. Roebling's Sons Division.

HIGHWAY, BRIDGES & STREET MATERIALS *continued*

240—Soil-Cement, Low Cost Paving

Bulletin SC123, issued by the Portland Cement Association, describes in detail the use of soil-cement for low cost pavements. Soil-cement hardens into a slab with enough rigidity and strength to spread loads over a large area of subsoil. Many applications are pictured and described. Diagrams shown.

Portland Cement Association.

241—Sign and Signal Spans

Bulletin BT-1 describes Pfaff & Kendall's sign and signal spans for highway, railroad, and allied applications. Built up to 110 feet in length and engineered to withstand winds up to 100 miles per hour. Specifications for box truss sign span given. Diagrams show construction and indicate dimensions.

Pfaff & Kendall.

242—Highway Guard Rail

Catalog FB-3461 describes Armco's *Flex-Beam* guardrail for safer highways. The requirements of good guardrail are outlined. Tables show available coatings and weights for lengths of various gages. Drawings show installation and details of components. Dimensions and physical properties. Photographs of installations.

Armco Drainage & Metal Products, Inc.

243—Traffic and Safety Equipment

This illustrated brochure describes Planet's new line of highway traffic and safety equipment. Included are overhead sign trusses, roadside directional signs, bridge railings, and pedestrian overpasses. Planet's highway products are illustrated and described in text. Engineered systems and automation equipment.

Planet Corp.

244—Roadway Lighting

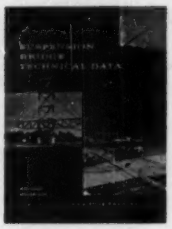
Bulletin 60-158 gives full information, including dimensions on the new OV-50 *Silverliner* 700 and 1000 watt mercury luminaire. These streamlined units are designed for wider roadways and heavy traffic areas. With remote or built-in ballast OV-50 luminaires are suitable for downtown areas, highway interchanges.

Westinghouse Electric Corp.

245—Expansion Plates And Bushings

Manual 55-2 contains complete information, technical data, and specifications about self-lubricating expansion plates and bushings for bridges, buildings, refinery equipment, chemical processing equipment, high temperature, missile, and atomic energy applications. Fully illustrated with photographs and diagrams.

Merriman Bros., Inc., Lubrite Division.



246—Suspension Bridge Data

Catalog D-943 contains technical data making possible preliminary calculations for comparative estimates between the suspension bridge and any other contemplated type. Includes formulas for determining cable and suspender lengths, cable tensions, erection calculations, and catenary formulas.

John A. Roebling's Sons Division.

247—Aluminum Lighting Standards

Kerrigan's new Catalog R-1 describes round tapered aluminum lighting standards. Covers shafts and arms for street, highway, bridge, and area lighting. Contains drawings and complete specifications. Also floodlight poles, traffic signal standards, and brackets and mast arms for wood, metal pole, and wall mounting.

Kerrigan Iron Works Co.

248—Cast Aluminum Post Lights

Folio 41 describes new 4-200, 4-300 series post lights by mcPhilben, featuring sturdy all aluminum construction, anodized finishes, and weatherproof bug-tight operation. For walkaways, paths, driveways, parking areas, schools, campuses, hospitals, shopping centers, housing developments and public buildings.

mcPhilben Lighting Co., Inc.

249—Bridge Deck Forms

Bulletin B-615 describes S-I-P (stay-in-place) bridge forms, a new and easy way of forming bridge deck slabs. Deep corrugated, galvanized steel sheets provide permanent strong forms for all types of bridges. Line drawings show comparison between conventional and S-I-P formed slab. Construction shown.

Granco Steel Products Co.

250—Safe Slip-Proof Surfaces

Bulletin describes the use of fused aluminum oxide and silicon carbide in the preparation of anti-slip surfaces on concrete floors, steps, sidewalks, concourses, and bridges. Methods of application. Can also be used with epoxy resins to cover existing surfaces. Samples in plastic containers included.

Exolon Co.

251—Catch Basin Drain Gratings

Brochure contains illustrations, drawings, data, and tables for *Irvico Dryway Draingrates,* which give highest strength to weight ratio, lighter weight for handling, maximum water intake, require lower investment due to smaller size inlet structure required. Various applications pictured.

Irving Subway Grating Co., Inc.

HIGHWAY, BRIDGES & STREET MATERIALS *continued*

252—Welded Steel Grating

Bulletin KSG-1-6-60 describes Kerrigan's *Weldforged* steel grating and treads. A concise, factual catalog. New arrangement of standard, close spaced, and tread data. Types for special applications located quickly. Complete tables on safe loads and weights. Specifying instructions. Installation photographs.

Kerrigan Iron Works Co.

253—All-Aluminum Davit Standards

Bulletin ALS-40 describes Pfaff & Kendall's all-aluminum davit standards. While slim and graceful, these lighting standards are engineered to perform in a rugged, functional manner. Each type of standard is described and complete specifications are given. Includes information on how to order.

Pfaff & Kendall.

INDUSTRIAL PROCESSING EQUIPMENT

254—Packaged Pulverizers

Bulletin AH-448 describes Hardinge's packaged pulverizer plant for dry grinding. For small scale dry grinding or pulverizing problem. Grinder is pictured together with list of component parts. Also described packaged pulverizer for wet grinding, a self-contained wet grinding and classifying system.

Hardinge Co., Inc.

258—Economics of Automatic Sampling

Economics of Automatic Sampling, presented at symposium of American Society for Quality Control. Paper translates sampling theory into practice, calculates cost, discusses installation. Tables list weights of material per cut for different cutter speeds. Eight types of samplers and numerous layout drawings shown.

Denver Equipment Co.

255—Metal Finishing Equipment

Catalog a661 describes Mahon industrial equipment for metal finishing or special processing. Industrial applications for surface preparation, rustproofing, spraying, drying and baking, dip or flow-coating, and special processing are pictured. Cutaways show construction and operation. Special control panels.

R. C. Mahon Co.

259—Air Conditioning and Drying

Bulletin K-160 describes the latest model (Model C) *Kathabar* Air Conditioning and Drying Systems. The equipment is used to stop condensation; speed drying and other processing operations; obtain sub-freezing dew-points; make air sterile to hospital standards. Multicolor diagram shows operation. Fully illustrated.

Surface Combustion.

256—Process Heating Technical Data

Bulletin 356, 24 pages of process heating technical data. Describes types, shapes, dimensions, heating surface, fittings, applications and installations of Panelcoil. Graphs, tables, methods of calculating heat transfer requirements and complementary physical and thermal data, arranged for easy reference.

Dean Products, Inc.

260—Ball-Type Flexible Struts

Catalog 229A describes Barco's ball type flexible struts for refineries, power plants, chemical plants, paper mills, steel plants, and steam and processing piping. Cutaway photographs show construction and diagrams show dimensions. Included are engineering applications, advantages, capacities, and general specifications.

Barco Manufacturing Co.

257—Quick-Opening Doors

Bulletin QO-61 describes sure-lock 3/30, quick-opening doors for production pressure vessels. Illustrates 16 models as applied to vulcanizers, sterilizers, autoclaves, and similar equipment. Photographs illustrate typical applications. Construction and operation diagrams.

Biggs-United Division
United Sheet Metal Co., Inc.

261—Glass Lined Process Equipment

Bulletin MG 105 describes A. O. Smith's *Glascote* products for the chemical processing industry. Includes such products as reactors, storage tanks, columns, conical rotary dryers and blenders, condensers, heat exchangers, and others. Complete specifications include dimensional drawings. Sales offices listed.

A. O. Smith Corp.

INDUSTRIAL PROCESSING EQUIPMENT *continued*

262—Pilot Plant Dryers

Bulletin AH-471 describes packaged pilot plant Ruggles-Coles rotary dryers. Outlines operation, speed, construction, and installation. Cross section diagram shows lifting flights. Detailed line drawing pictures arrangement and gives complete dimensions. Applicable for small capacity unit processing.

Hardinge Co., Inc.

263—Steel Welding Fittings

Bulletin VC3-H describes a new gate valve that can be throttled like a globe. Tables showing rating, pressure, operating temperatures, and many uses are included. Available in both solder end and threaded end. The size range is listed along with dimensions and cutaways. Air, water, oil and gas.

NIBCO Inc.

INSTRUMENTS, CONTROLS and GAUGES

264—External Chamber Level Controls

Catalog Section 6 illustrates a broad line of liquid level instruments used for control, alarm or shut down. Both float and displacer types are described for operation with liquid pressure up to 5000 psi. Special features for corrosion and vibration service or interface applications are also included.

Magnetrol, Inc.

268—Constant Feed Weight Systems

Catalog 14 covers systems for continuously maintaining uniform flow rates of solids or liquids used in processing and formulating bulk materials. Details the use of unitized components to reduce development costs of job-engineered systems. Section on control instrumentation and photographs.

Weighing & Controls, Inc.

265—Annunciator Systems

A 4 page bulletin on modular Scam *De-Line* annunciators furnishes complete sequence charts and dimensional drawings and information, explains advantages of plug-in relay. Also describes *Twinpoint* system which provides two complete alarm points in each cabinet position.

Scam Instrument Corp.

269—Centralized Control Systems

Bulletin 106 describes Panellit's design approach, materials, construction, and modern facilities used in manufacturing a variety of centralized control and data presentation systems. Various types of panels to suit every requirement are illustrated. Close-up photographs of actual installations show craftsmanship.

Panellit, A Division of ISI, Inc.

266—Specifying Guide for Tank Gages

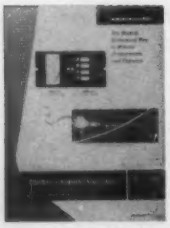
Form 632 is a specification guide especially designed in handy folder form to assist consulting engineers to specify their choice of tank contents gaging systems for each project. Contains sample specifications for hydraulic system, and hydrostatic systems (manually operated and continuous reading).

Liquidometer Corp.

270—Remote Liquid Level Gages

Section C1.1D describes Reliance's remote reading liquid level gages, wall or panel mounting, steam boiler or tank service. Chart shows models for wall or panel mounting along with working steam pressure range and water level variation. Gages are illustrated. Includes complete description and dimensions.

Reliance Gauge Column Co.



267—Indicating and alarm Systems

Bulletin 3036C describes in detail the Edison *Omniguard* indicating and alarm system. A reliable low-cost temperature detection for small or large installations. Features, operation, specifications, connections, wiring diagram, and installation procedures are given. Various types are pictured and described.

Thomas A. Edison Industries.

271—Vapor Tension Thermometers

Catalog 76-T describes the Marsh line of rigid stem and distant reading vapor tension thermometers furnishing fahrenheit and centigrade ranges. Illustrates the wide selection of case patterns and standard dials available. All data necessary for accurate specifications. Also covers piping and duct thermometers.

Marsh Instrument Co.

INSTRUMENTS, CONTROLS & GAUGES *continued*

272—Midget 3-Way Solenoid Valves

Bulletin 8317 describes ASCO's new *Midget* 3-Way solenoid valves, which provide the fastest cylinder or diaphragm return of any valve their size. Information includes applications, operation, and list prices. Shows flow diagrams of various constructions and gives complete specs. Ordering information.

Automatic Switch Co.

273—Differential Pressure Switches

Bulletin E-30 describes Dwyer's new model No. 1630 differential pressure switches. Includes application characteristics, ordering instructions, and complete specifications. Gives lead wire color codes to pilot lights together with rated life. Installation procedures, adjustment, and mounting template.

F. W. Dwyer Manufacturing Co.

274—Automatic Temperature Controls

Condensed Catalog 27 describes and illustrates the 1961 line of Barber-Colman temperature and humidity controls. Valve selection data is included for easy reference. Featured is an entire new line of room thermostats in single and duplex models for electrical ratings up to ½ horsepower.

Barber-Colman Co.

275—Fire Alarm Systems

Catalog F249 comprises several bulletins in a binder completely describing *Flexalarm*, Gamewell's fire alarm systems. Bulletin F249A describes and illustrates the systems components; F249C gives complete specifications and circuit diagrams; 131 and 132 detail local fire alarm control cabinets. Special systems.

Gamewell Co.

276—Turbine Flow Meter

Brochure SP-11008 describes flow meters and auxiliary equipment for in-line fluid flow indication, recording, telemetering, or control in chemical, petrochemical, refinery, pipe line, gathering line, food processing, LPG and any other fluid flow metering and control system. Long-life accuracy.

Halliburton Co.

277—Pressure Reducing Regulators

Bulletin C-95A contains capacities, materials and construction data on Fisher Series 95 self-contained pressure reducing regulators. They are available for temperatures up to 450° at 300 psi with stainless steel trim. Air, steam, and water capacities in tabular form. Performance curves and dimensions.

Fisher Governor Co.

278—Detector Specifying Guide

Specification Guide for Holiday electrical inspection in handy folder form contains information on types of detectors, inspection methods, and techniques. The guide includes other material to aid consulting engineers in obtaining adequate inspection of coating systems. Detectors are illustrated.

Tinker and Rasor.

279—Liquid Waste Flow Meter

Bulletin 28 describes the Stevens Model 60M total flow meter. A completely new instrument designed to meet the need for low-cost yet is accurate and dependable. Instrument for measuring the flow of sewage, industrial wastes, or other liquids in open channels. Portability and versatility are featured.

Leupold & Stevens Instruments, Inc.

280—Controlled Speed Systems

Bulletin F-1952 describes 12 representative controlled speeds applications using U. S. *Varidrives*, *Varidyne*, *Varitrol* (pneumatic or electric), *Dial-A-Torq*, torque motors, centralized control panels, and other components to control motor speeds. Drawings show how variables are used to control processes.

U. S. Electrical Motors Inc.

281—Desk Thermostats

Executat, a new type desk thermostat designed for precise temperature control of the individual's immediate environment, is featured in circular 382A. A handsome addition to an executive's desk, it can be easily connected to any type of control system. Unlike wall-mounted thermostats, is easily relocated.

Powers Regulator Co.

282—Clock and Program Systems

Covers clock and program systems — two types include synchronous motor-powered secondary clocks, the other combining secondary clocks, minute-impulse type. Both have simplified programming, automatic resetting of secondary clocks. Bell control boards, various type signals, and clocks included.

Standard Electric Time Co.

283—Control Catalog

Catalog GEC-1260D describes General Electric's complete line of general purpose control. In addition to pricing and application data, and guide form specifications, the new catalog contains a horsepower selection chart which simplifies choosing control for motors ranging from ¼ to 200 hp.

General Electric Co.

INSTRUMENTS, CONTROLS & GAUGES *continued*

284—Boiler Water Level Controls

Catalog section 3 describes complete line of standard and special water column, control, and low water cut-offs for low, medium, and high pressure steam or hot water boilers. Units classified by function and type of service for easy reference. Theory and operation of these unique controls explained.

Magnetrol, Inc.

285—Quantity and Level Control

Bulletin describes *Prob-A-Larms*, a practical, low cost method of detecting and controlling quantities and levels of liquids, powders, and grains. High level alarm, low level alarm as well as high and low cycling for pumps or drains are common applications. Well illustrated.

Weighing & Controls, Inc.
Subsidiary of CompuDyne Corp.

286—Recording Annunciators

A new four-page bulletin describes recently introduced recording annunciator systems. Three basic models with 32, 64 and 1000 point maximums. Printed record includes specific condition; and month, day, hour, minute, and second of occurrence. Describes benefits of automatically printed records.

Scam Instrument Corp.

287—Interlock and Shutdown Systems

Bulletin 105 illustrates and describes *Panalarm* Interlock and Shutdown system. This control system permits centralized regulation of each phase of the operation. Isolates and prevents the spread of trouble in complex inter-dependent operations. Typical operational sequence charted. Dimensions included.

Panellit, A Division of ISI, Inc.

288—Electric Water Level Gages

Section C7.1 describes the Reliance *Electro Eye-Hye*, electrically operated remote reading devices for boiler water levels. Suitable for service up to 3000 psi steam, 5000 psi cold. Needs no pressure connections at instrument panel or compensating devices of any kind. Components of this system are illustrated.

Reliance Gauge Column Co.

289—Differential Pressure Switches

Bulletin E-40 describes Dwyer's new model No. 1800 differential pressure switches, capable of very sensitive actuation. Gives application characteristics, complete specifications, and ordering instructions. Operating instructions include operation, installation procedures, and adjustments. Complete parts list.

F. W. Dwyer Manufacturing Co.

290—Tank Contents Gaging Systems

Suggested specifications for tank contents gaging systems – hydraulic, hydrostatic, and direct reading – are given in bulletin 463A. Model selection guides and pictorial diagrams are included, along with a list of liquids successfully gaged by Liquidometer systems, and principles of operation of each gage.

Liquidometer Corp.

291—Resistance Temperature Detector

Bulletin 3047 describes the Edison resistance temperature detectors – stable, accurate, fast, sensitive, and rugged. Comparisons are made between the old type detectors and the new. Reliable temperature measurement is vital to modern industry. Operating principle, history, and advantages are included.

Thomas A. Edison Industries.

292—Complete Line of Gauges

Catalog 76-G contains descriptive information on the broad Marsh line of gauges. Evaluates exclusive Marsh features; illustrates choice of easy reading dials and case patterns. Cites standard gauges for specific applications. Also covers solenoid and needle valves often used on applications requiring gauges.

Marsh Instrument Co.

293—Solenoid Valves

New direct lift 2-way ASCO 8030A solenoid valves handle gas, air, water, steam, and other noncorrosive fluids at pressures to 4 psi, temperatures to 215°F. Valves are designed for any low pressure control system; handle gas to boilers; used as electrical checking devices for vacuum pumps and systems.

Automatic Switch Co.

294—Buried Pipeline Detector

Bulletin PD describes Tinker and Rasor's transistorized Pearson-type Holiday detector for locating electrical contacts on pipelines, open couplings and discontinuities in coating, without uncovering the pipeline. Bulletin furnishes specifications, operating data and components. Photographs show use.

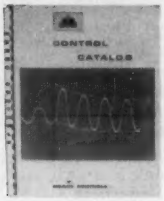
Tinker and Rasor.

295—Hydrologic Instruments

Short Form Catalog No. 23 summarizes the Stevens line of hydrologic instruments and accessories. Included are descriptions and photographs of Stevens liquid flow recorders and indicators, liquid level recorders, telemetering systems; servo controls, precipitation recorders and gages, accessory equipment.

Leupold & Stevens Instruments, Inc.

INSTRUMENTS, CONTROLS & GAUGES *continued*



296—Electric Heat Thermostat Manual

Bulletin describes Mears' line of controls for electric heat and air conditioning, in wall mount and inbuilt models. Also describes water heat thermostats and load regulators. Includes heat tube selection dimensional diagrams, wiring diagrams, and Knob rotation charts. Lists Mears representatives in this country.

Mears Controls, Inc.

299—Centralized Controls

Bulletin 54-1004 discusses the latest developments in centralized control for air conditioning and other operational systems for buildings. Outlines selective and continuous indication, logger-scanning and alarm-scanning, fan room panels, and unified manufacturing versus field assembly of components.

Minneapolis-Honeywell Regulator Co.

297—Metering Systems

Bulletin 400 discusses proportioning and metering systems. Transmitters are activated by air pressure, hydraulic differential, or float level. Each type of transmitter produces an interrupted time interval electric output signal to proportion feed or actuate meters. Bulletin discusses design and operation.

Infilco Inc.

300—Self-Operating Regulators

Bulletin 1000M describes Trerice self-operating temperature regulators. Data includes applications, construction, valves, and adjustment. Lists recommended temperature range combinations. Ordering instructions and lists prices given. Various models are illustrated. Other Trerice products pictured.

H. O. Trerice Co.

298—Industrial Liquid Level Gages

King-Gage Catalog 1010 gives details and specifications of hydrostatic gauges for measuring depth, volume, or weight of almost any liquid in any tank or processing vessel, under pressure or vacuum, from any desired location. Describes operation; shows applications in many industries; gives installation data.

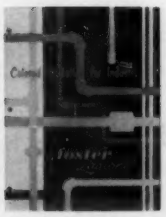
King Engineering Corp.

301—Water Flow Instruments

Miniature Strip Chart Instrument for complete and accurate indication, totalization and recording of fluid flows. Provides same functions as larger instruments; requires less panel space. Bulletin 330 shows working mechanism, chart capacities, installation specifications.

Sparling Equipment
Hersey-Sparling Meter Co.

INSULATION & PROTECTIVE COATINGS



302—Thermal Insulation Protection

Bulletin describes Foster's *Lagtone*, a single protective coating for pipes, duct, and equipment. Photographs of various applications are combined with drawings showing proper insulation procedures. Chart shows colors available. Data includes viscosity, coverage, drying time, and temperature limits.

Benjamin Foster Co.

304—Gilsulate Applications

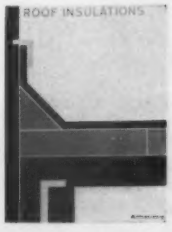
Illustrated booklet S-88 gives the complete story of *Gilsulate;* what it is, what it does, how it's used, and who uses it. Booklet explains installation procedures and insulating valves. Also tells of the organization in back of *Gilsulate* — checking of piping layouts and soil conditions and supervision of installations.

American Gilsonite Co.

303—Pipe Protection Tape

Bulletin introduces Tapecoat 20, an improved, hot-applied, pliable coal-tar coating in tape form, gauged for thickness. Includes polyester film outer wrapper. Designed for single-thickness application with minimum overlap. Easy to apply on pipe, joints and fittings, conduit, cable, insulated pipe, tie rods.

Tapecoat Co.



305—Temlock Roof Insulation

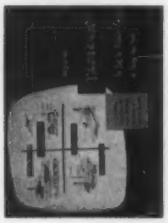
Bulletin R1-S-61G contains complete information and specifications for Armstrong *Temlok* roof insulations. Describes insulating efficiency, strength characteristics, and physical properties. Charts and tables help you determine the amount of roof insulation needed. Complete installations procedures shown.

Armstrong Cork Co.

INSULATION & PROTECTIVE COATINGS *continued*

306—Protection for Chimneys

Bulletin describes *Stakfas* designed exclusively to resist acid corrosion from high sulfur fuels, a protection for brick, steel, and concrete chimneys. Tables give evaluation of heat resistance and elasticity and acid resistance. Typical *Stackfas* applications in diagram. Application methods described. Specifications.
Benjamin Foster Co.



307—Coal-Tar Protective Tape

Hot coal tar protection in easy-to-apply tape form for pipe, pipe fittings and joints, conduit, cable, insulated pipe, tie rods. Material is heated lightly to soften the pitch, then spirally wrapped onto pipe surface. Tapecoat provides long-life protection equivalent to a hot-applied coal-tar pipeline coating.
Tapecoat Co.

308—Pipe Insulation News

News magazine, published by the manufacturer of Gilsulate insulation for underground hot pipes, carries stories and articles on actual installations. This issue describes use of Gilsulate by Caterpillar Tractor Co., gives a report on Gilsulate efficiency, and instructions for tamping the Gilsulate bed. Illustrated.
American Gilsonite Co.

309—Flame Retardent Polyethylene

Technical bulletin RCT-710 deals with the historical development, flammability of polyethylene compositions, physical and electrical test data, properties, electrical characteristics, and processing of flame-retardent Polyethylene for wires and cables. Included are tabular data, bibliography, specifications, and charts.
Rome Cable Corp.

310—Wire and Cable Insulation

This illustrated 6-page manual 9-114 describes *Silastic®* wire and cable insulation for reliable service under the most severe operating and environmental conditions. Outstanding properties include resistance to temperature extremes and variations from –90 to 260° C. Photographs show installations and details.
Dow Corning Corp.

311—Styrofoam Pipe Vessel Covering

Bulletin 157-57 describes *Styrofoam* for superior low temperature pipe insulation. Engineering data includes physical and thermal properties, water resistance, and vapor transmission. Specifications for various types of applications are illustrated. Thickness standards and recommended thicknesses.
Dow Chemical Co.

312—Acid Resistant Paint

Bulletin describes Sauereisen No. 47 acid resistant paint, an excellent protective coating for buildings, concrete, and steel. Gives information on types of acid it is resistant to, coverage, and application procedures by brush and by spraying. Safety measures are also included, as well as basic features.
Sauereisen Cements Co.

313—Concrete Pipe Protection

Bulletin R-2 describes *Rexon* Coating No. 2, a synthetic hard rubber which vulcanizes to concrete sewer pipe or other masonry surfaces by catalytic action to form an acid-resistant, solvent-proof and pin-hole free coating. It is applied by brushing or spraying. Full details on application and coverage.
Hamilton Kent Manufacturing Co.

LIGHTING FIXTURES & ACCESSORIES

314—Floodlights

Bulletin EF-760 describes a new series of 5 Appleton *Intenso* floodlights, a part of the new *Intenso* family recently announced. Brochure listing a total of 9 different models open and enclosed and 5 NEMA types. Lighting curves, accessories, and technical specifications are all a part of this bulletin.
Appleton Electric Co.

315—Flood Lighting Equipment

User Net Price List 61-320, describes the full line of Westinghouse flood lighting equipment. The bulletin is illustrated with a photograph of each unit, provides a general description of the unit, construction and lamp details, ordering information, shipping weights, and suggested net user prices. Accessories listed.
Westinghouse Electric Corp.

LIGHTING FIXTURES & ACCESSORIES *continued*

316—Commercial, Industrial Lighting

User Net Price List 61-020, describes the full line of Westinghouse commercial and industrial lighting fixtures. The bulletin is illustrated with a photograph of each unit, provides a general description of the unit, construction and lamp details, ordering information, shipping weights, and suggested net users prices.
Westinghouse Electric Corp.

317—Industrial Florescent Lighting

Bulletin F describes the newly designed and expanded line of industrial fluorescent lighting fixtures offered by the Benjamin Division of Thomas Industries Inc. Catalog includes detailed illustrations and complete specifications covering all elements of the line. The many features of this new line are explained.
Thomas Industries Inc., Benjamin Div.

318—Combination Fixtures

Bulletin describes the *Ventro-Lux* fixture manufactured by Curtis-AllBrite. Provides light, heat, cooling, and ventilation in the one troffer. It cools, heats, and ventilates more quickly, more effectively, and more completely. Cutaway shows construction and operating principle. Specifications and dimensional data.
Curtis-AllBrite Lighting Inc.

319—Recessed Incandescent Lighting

Careful attention to details of design and engineering is combined with highest quality construction materials in Litecraft's *Endura* series. Fixtures are built to fit so precisely into the ceiling they become an integral part of it. Catalog Section K gives all details, including cross-sectional drawings.
Litecraft Manufacturing Corp.

320—Fluorescent Lamp Ballast Guide

Bulletin ATC-111 is a new fluorescent lamp ballast buyer's guide, listing the newest models. Included is electrical data, physical dimensions, packaging of popular 60 cycle ballasts and prices. Information is in tabular form for easy reference. Also includes conditions of sale and other pertinent information.
Advance Transformer Co.

321—Indoor Luminaire Maintenance

Safe low-cost floor-level servicing of high-bay luminaires is described and illustrated in bulletin TH-57. The five basic requirements for a Thompson hanger installation, available hanger models, accessories, Underwriters' ratings, and range of applications also are outlined in detail. Illustrated.
Thompson Electric Co.

322—Indirect Lighting System Manual

Catalog A-2 describes *Sightline®* a new nearly invisible lighting system which blends decoratively into the ceiling. Installation and wiring data includes exploded views and diagrams. Charts and tables of illumination data. Tabular data gives ordering information including units needed in any given distance.
Sunbeam Lighting Co.

323—Fluorescent Lamp Ballasts

GEC-983 gives full information, including prices and electrical data, for a complete line of fluorescent ballasts. Covered are rapid-start, instant-start, pre-heat-start, dimming, outdoor, plastic sign, and weather-proof ballasts. Data on new *Bonus Line* ballasts. Wiring diagrams, dimensions, and installation data.
General Electric Co.

324—Shallow Troffer Fixtures

Booklet V-700A describes entire scope of shallow troffer line. Eight standard shielding types plus installation information about mounting accessories for various types of acoustical ceilings are illustrated and described. Complete specification and product features are included plus details on recessed lighting.
Sylvania Electric Products Inc.

325—Hinged and Framed Troffers

Specification Sheet 30 describes the hinged and framed troffer manufactured by the Wakefield Company. Photograph illustrates actual troffer and line drawing gives specific dimensions. ETL photometric report included. Line drawings show units to fit various ceiling constructions. Gives specifying points.
Wakefield Corp.

326—Fluorescent Ballast Guide

Bulletin FL-370A is a Buyer's Guide for fluorescent lighting ballasts. Complete description of warranty, service plan, certifications and other pertinent information. Electrical and mechanical specifications in tabular form given for various types of lamps, indoor and outdoor installations.
Sola Electric Co.

327—Recessed Fluorescent Lighting

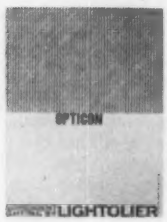
"Smoot-Holman Recessed Troffers", available for use in the western states, are described in an 8-page full color brochure. These highly flexible fixtures blend with modern architecture and are ideal for offices, banks, schools, stores. Sizes: 1′ x 4′, 1′ x 8′, 2′ x 4′, 2′ x 8′. Suggested layouts shown.
Smoot-Holman Co.

LIGHTING FIXTURES & ACCESSORIES *continued*

328—Bonus Line Fluorescent Ballasts

GEA-6912 describes new *Bonus Line* fluorescent ballasts for indoor commercial and industrial applications. New capacitor and special thermal protector are new ballast developments by General Electric. Bulletin gives full information on *Bonus Line* protection features, plus ratings, electrical data, dimensions.

General Electric Co.



329—New Fluorescent Fixtures

Opticon, a new concept in fluorescent lighting by Lightolier, features an injection molded lens for precise light control and maximum rigidity. In continuous runs, it presents a fine, finished appearance with no dark joiner strips. Here is quality lighting at modest cost for school, office, and institution.

Lightolier Inc.

330—Air Handling Troffers

Bulletin B describes a completely new concept in air-handling troffers, available with the *Triple-Shell Lumi-Flo*. An important feature is that the air passageway is completely isolated from the troffer housing. This removes the possibility of temperature variations affecting the light output of the unit.

Benjamin Div., Thomas Industries Inc.

331—Multi-Vent Troffer

Sylva-Flo brochure gives complete story on combination light and air troffers using patented *Multi-Vent* principle. Superior air-conditioning, higher light efficiency, truer lamp color, longer ballast life are a few of the benefits. Includes technical data, both air handling and photometric, plus specification details.

Sylvania Electric Products Inc.

332—Reassembled Ceiling Fixtures

Specification Sheet 14 describes the Wakefield Twenty, a quickly installed, pre-assembled, luminous ceiling unit. Dimensional drawing and photograph of the unit shown along with line illustrations of various types of diffusers. Drawings for installation purposes and specifications are included.

Wakefield Corp.

333—Ballast Cross Reference Guide

A fluorescent lamp ballast cross reference guide published by the Advance Transformer Company. Gives obsolete Advance ballasts catalog numbers along with suggested replacements. Also shows catalog numbers of ballasts manufactured by other companies and gives Advanced catalog numbers for suggested replacements.

Advance Transformer Co.

334—Light and Air Diffusers

Catalog OD-1040 describes light and air diffusers in one unit. Line drawings show construction and operation of various types. Includes selection of illumination levels, installation planning, and fundamentals of fixture selection. Fixtures illustrated with specifications. Air distribution and lighting performance data.

Day-Brite Lighting, Inc.

335—Troffers and Brackets

Guth File 3 consists of 10 pages describing various types of wide recess troffers. Data includes models and installation, type of diffuser, construction, finish, wiring, and lighting data. Photographs show various models and line drawings show dimensions. Swing mounting brackets simplify installation.

Edwin F. Guth Co.

336—Industrial Luminaires

Bulletin describes CA88 *Alzak* industrial luminaires by Curtis-AllBrite. This new and improved fluorescent lighting fixture provides more glare-free light in industrial plants. The use of *Alzak* aluminum reflectors assure maximum light. Contains illustrations, specifications, and dimensional data.

Curtis-AllBrite Lighting Inc.

337—Interior Lighting Design

Booklet A-7235 is a 60-page, pocket-size manual on footcandle levels and interior lighting design. Contains valuable information including tables which apply to modern luminaires and light sources. Easy to use tables show luminaire, distribution, spacing, coefficients of utilization, and maintenance, factors.

Westinghouse Electric Corp.

338—Recessed Fluorescent Lighting

Designed to create a new standard in troffer engineering, Litecraft's *Imperiale* series offers an unusual combination of construction, performance, and installation characteristics. Catalog Section R details features, provides ceiling system drawings, and gives complete lighting data on wide range of shieldings.

Litecraft Manufacturing Corp.

339—Mercury Lamp Transformers

Bulletin BMV-430, Buyer's Guide containing complete listings of mercury lamp transformers. Includes outline dimensions for housings. Complete specifications in tabular form for indoor and outdoor service. Accessories and adoptres are diagramed and include dimensions. Wiring diagrams for circuits.

Sola Electric Co.

LIGHTING FIXTURES & ACCESSORIES *continued*

340—Sports Lighting Design Manual

Design Book B-5872-A gives basic information on the design and selection of proper equipment for sports applications. Applications described range from practice putting greens to major football stadiums. Includes lamp data, mounting heights, and pole types. Lighting layouts, transformers, and wire selection.
Westinghouse Electric Corp.

341—Modern School Lighting

Booklet "The A-B-See of Modern School Lighting," written by a research engineer, is factual and authoritative. Various problems of classroom lighting, glare, reflection, daylight, artificial light are discussed. Types of fixtures are pictured with comparison charts and conclusions. Free to the consulting engineer.
Smoot-Holman Co.

342—Mercury Lamp Ballast Guide

Bulletin GEA-7056 provides specifiers information on how to select and apply mercury lamp ballasts. Gives data on five construction types. Includes effects of operating conditions, dimensions, electrical data, line current characteristics, outline drawings, and wiring diagrams. Features of this ballast illustrated.
General Electric Co.

343—Quartz-Beam Floodlights

Bulletin 2725 introduces a compact, highly efficient floodlight designed for the quartz-iodine lamp. Buildings, signs, golf driving ranges, and many other uses are possible applications for the new floodlight, which takes advantage of the long lamp life and high efficiency of the quartz-iodine lamp.
Crouse-Hinds Co.

344—Special Purpose Lighting Units

Folio 61-1, a 12 page booklet, describes mcPhilben's unique line of cast aluminum special purpose lighting units. Applications for vaportight, exterior, general interior use and directional signs. Includes specifications, drawings, and optional features to assist you in selection of quality lighting.
mcPhilben Lighting, Inc.

345—Hospital Lighting

Special hospital issue of the Day-Briter covers hospital lighting, day and night. Describes units for operating rooms, patient's wards, administration and service areas. Types of fixtures applicable to hospital service are illustrated. Lighting layout suggestions are diagrammed. Includes footcandle recommendations.
Day-Brite Lighting, Inc.

346—Outdoor Luminaire Maintenance

Safety and cost-saving features, typical installations, operating procedures, and available models of Thompson *Servisafe* pole and bracket units are covered in bulletin PWB-59. *Servisafe* products permit fast hazard-free ground-level luminaire servicing by one man to assure year-round lighting efficiency.
Thompson Electric Co.

347—Plastic-Enclosed Fixtures

Section 1, pages 43 and 44, dsecribes Miller's two lamp *Duplex-a-lite*, a new plastic-enclosed fluorescent lighting fixture. Application data and complete specifications included. Tables of brightness, coefficients of utilization, and area covered by each luminaire included in illumination calculations.
Miller Co.

348—Emergency Lighting Equipment

Bulletin gives specifications for Light Warden 6-volt, battery-operated emergency lighting equipment. Gives types of batteries available, information on charging, types of lamps, other standard equipment with unit, description of cabinet. Equipment approved and listed by Underwriters Laboratories.
Electric Cord Co.

To order copies of the bulletins, please fill out the card between pages 2 and 3 or 58 and 59.

349—Lighting Design Values

Technical bulletin 110 supplies lighting design values for two-stage lighting as obtained with a Slater *Hi-Lo* dimmer switch. Tables have been compiled to assist the architectural lighting designer in planning illumination requirements to meet new I.E.S. standards. Wiring diagrams included.
Slater Electric & Mfg. Co., Inc.

350—Kolordot Squares

Bulletin 101 describes *Kolordot* squares which give new color dimension in luminous *Gratelite* ceilings and fixtures. Come in four colors enabling you to install colorful mosaic patterns or directional arrows in *Gratelite* ceilings. Tells how to order and how to install *Kolordot* squares. Available colors shown.
Edwin F. Guth Co.

LIGHTING FIXTURES & ACCESSORIES *continued*

351—Lighting Duct

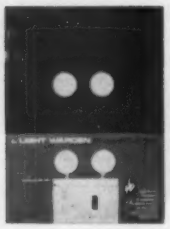
Bulletin ULD-660 describes BullDog's *Universal* lighting duct. Presents pictorially the components of this flexible lighting system which suspends and electrically energizes lighting fixtures and small power tools. Lists various types of duct, suspension equipment, and fittings.

BullDog Electric Products Division
I-T-E Circuit Breaker Co.

352—Efficient Fluorescent Lamps

Bulletin A-7263 describes Westinghouse high efficiency fluorescent lamps. Contains features, technical data, and comparative output chart. Typical applications for these lamps are listed and pictured. Advanced engineering achievements as plated leads, silicone coating, triple coiled electrodes are shown.

Westinghouse Electric Corp.



353—Automatic Emergency Lighting

Bulletin describes Electric Cord Company's automatic emergency lighting that instantly provides illumination when regular power supply is interrupted. Various models listed with complete specifications. Includes exit lights, low voltage flood extensions, explosion proof heads, wall mounting brackets.

Electric Cord Co.

354—Recessed Dome Fixtures

Brochure 34 describes recessed dome fluorescents offering simple, clean circles of abundant, evenly diffused illumination. White enameled aluminum trim flanges for flush mounting in plaster ceiling, or overlapping acoustical tiles. Dimensional accuracy of diffuser frame assures a precision fit preventing light leakage.

Lightolier Incorporated.

355—Recessed Lighting System Manual

Catalog D describes Shallobeam, a new ultra-shallow, recessed lighting system specifically engineered for today's trend toward reduced ceiling heights. Various models are illustrated. Features in line drawings. Basic dimensions and installation data including mounting methods. Types of diffusers shown.

Sunbeam Lighting Co.

356—Quartzlite Floodlights

Bulletin QL-15-161 describes complete new line of Appleton *Intenso "Quartzlite* 1500" watt floodlights. Consist of three different beam spread models, each available in two different mountings. Features, applications, and accessories included. Components shown in photographs. Photometric data. Price list.

Appleton Electric Co.

MATERIALS HANDLING & STORAGE FACILITIES

357—Centrifugal Thrower Units

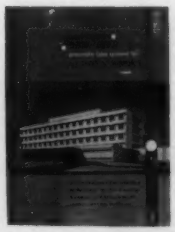
Bulletin 460 describes centrifugal thrower units. Features comprehensive technical engineering data, specifications, graphs, drawings, diagrams, charts, and application photographs. Centrifugal thrower units can be applied to a wide range of dry, granular, flaky and small lump bulk materials handling operations.

Stephens-Adamson Mfg. Co.

358—Bucket Elevators

Comprehensive bulletin describes standard enclosed, positive-discharge, open inclined, super-capacity, and double-leg grain elevators manufactured by Barber-Greene. Included are job photographs, advantages and applications of each type, simplified selection table, cut-aways, and detail photographs.

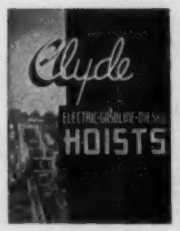
Barber-Greene Co.



359—Transitubes for Hospitals

Bulletin E 21 describes pneumatic tube systems specially designed by The Grover Company for all types of hospitals. Systems range from small two-station directly connected types to the latest automatic installations linking a hundred or more stations. Illustrated.

Grover Co., Subsidiary of the
Powers Regulator Co.



360—Power Hoists

Bulletin 34A, 20 pages, describes the Clyde line of electric, gasoline, and diesel hoists. Gives construction details of medium capacity hoists of various line pulls. Also includes information as to selecting the hoist, information required for hoist quotation, and table of drum cable capacities.

Clyde Iron Works, Inc.

MATERIAL HANDLING & STORAGE FACILITIES *continued*

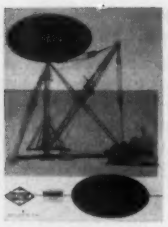
361—Vacuum Materials Handling

Bulletin V-100-R describes how Whiting Pressuregrip vacuum handling systems move heavy loads by using the physical pressure of the great sea of air which surrounds the earth. Cross section sketches show how grippers work. Basic components are pictured and described. Pressuregrip systems will fit every need.
Whiting Corp.

362—Power Free Conveyors

Bulletin 960 describes Columbus McKinnon's *Power-Flex*, the power and free conveyor system with *Telematic* automatic dispatch control. Designed for automated materials forwarding applications in industrial plants, distribution centers, service buildings and department stores. Construction shown.
Columbus McKinnon Corp., Conveyor Div.

To order copies of the bulletins, please fill out the card between pages 2 and 3 or 58 and 59.



363—Steel Derricks

Bulletin 9-H describes Clyde steel derricks, a complete line of modern derricks. Derricks for various applications are pictured. Complete specifications and capacities are given in tabular form. A number of Clyde features are outlined and illustrated. Ordering information. Information on Clyde Hoists included.
Clyde Iron Works, Inc.

364—Tile Tanks and Linings

Bulletin A-160 outlines scope of complete engineering, installation, and maintenance service on tile-faced reinforced concrete tanks, chests, vats, silos, and others. Also includes a wide range of ceramic and membrane linings for resistance against corrosion and abrasion. Various types of tanks are illustrated.
Stebbins Engineering & Mfg. Co.

365—Overhead Traveling Cranes

Bulletin 5000B covers Conco custom-engineered overhead electric traveling cranes, of double girder construction. Can be furnished in a wide range of capacities and spans. Also included are hand-powered overhead traveling cranes, hand-powered and electric hoists.
Conco Engineering Works,
Division of H. D. Conkey & Co.

366—Powerhouse Gantry Cranes

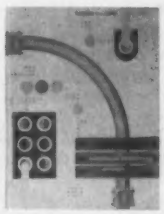
Catalog 125 describes American's *Powerhouse* Gantry Cranes designed for situations demanding large capacity handling. Important features are described and illustrated. Hydro-electric projects at Noxon Rapids for Washington Water Power Company and at Big Bend for the California Oregon Power Co. shown.
American Hoist and Derrick Co.

367—Industrial Water Storage Tanks

Graver's house magazine, the ECHO, offers interesting case histories of storage tanks for industries and municipalities, and of specialized process vessels in steel and alloys. Several new storage designs are described, and the issue is both readable and informative. Applications illustrated.
Graver Tank & Mfg. Co.

368—Elevator Systems

Catalog SW-1 describes the complete line of Haughton Elevators, with special detailed information given on Haughton "*Auto-Signamatic*" systems for complete automation of multiple-unit elevator groups. Includes recommended sizes and dimensions for passenger, freight, hospital elevators, and dumbwaiters.
Haughton Elevator Co.



369—Pneumatic Conveying Systems

Information on how pneumatic conveying solves bulk handling problems is presented in Bulletin 530. System diagrams point out application and flexibility of equipment. Typical installation illustrated. Bulletin lists materials which can be handled and illustrates accessories.
Dracco Division of Fuller Co.

370—Variable Stroke Vibrating Feeder

Bulletin 261 describes *Solid Stroke* Variable Rate Mechanical Vibrating Feeders. Features comprehensive, technical, and engineering data, specifications, graphs, diagrams, load rating and capacity charts, drawings, and application photographs. *Solid Stroke* feeders can be applied to many feeding operations.
Stephens-Adamson Mfg. Co.

371—Industrial Storage Systems

Catalog 9129 gives construction details, sizes and capacities of Marietta industrial silos. Line drawings show construction details and photographs show installations. Complete information on Marietta's construction service. Shows the four types of concrete staves offered.
Marietta Concrete Division
American-Marietta Co.

MATERIAL HANDLING & STORAGE FACILITIES *continued*

372—Perimeter Materials Handling

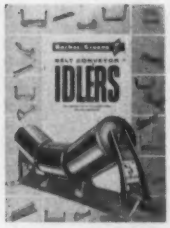
Bulletin 661 is reprint of article appearing in Western Materials Handling. Describes installation of an automatic perimeter merchandise handling system in a newly constructed department store, the May Company in Mission Valley. Detailed diagram is keyed to picture series showing various components.

Columbus McKinnon Corp., Conveyor Div.

373—Automatic Handling Systems

Catalog 67-A describes, illustrates (photographs and diagrams) engineered and automated handling systems. The 16-page "Plan with Planet" brochure also illustrates equipment for bulk and unit materials, automated and special handling machinery, and foundry equipment. Describes Planet's creative service.

Planet Corp.



374—Belt Conveyor Idlers

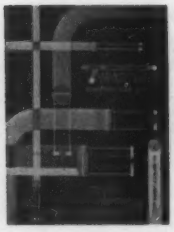
Sales Manual, Page 3200, describes belt conveyor idlers manufactured by Barber-Greene. Complete line is illustrated; and advantages are given. Cutaways show construction. Selection tables and instructions. Line drawings accompanied by tables of weights and dimensions. Conveyor components shown.

Barber-Greene Co.

375—Storage Batteries

Bulletin 6513 gives inside facts on why *Exide-Ironclad* batteries have more electrical capacity with no increase in physical size. Unique square-tube positive-plate units enable electric industrial trucks to work longer, harder and faster. Table lists power increases according to battery type.

Exide Industrial Marketing Division.



376—Pneumatic Tube Systems

A 52-page handbook designed to aid consulting engineers in the selection of pneumatic tube systems. Industrial applications, variety of systems available, and engineering data are contained in this reference manual. Fully automatic systems with self-seeking carriers for all types of product handling.

Grover Co., Div. Powers Regulator Co.

377—Overhead Materials Handling

Whiting's *Trambeam*® overhead materials handling systems, crane and monorail, are described in bulletin M-34. Four page spread pictures many applications, large and small, as well as special applications. Various components, which make up the system, are pictured and described. Advantages outlined.

Whiting Corp.

378—Derricks for Every Purpose

Catalog 200-D-4 describes American steel derricks for handling heavy materials. Guy, stiffleg, steel erector, barge mounted, and special derricks with capacities from 2½ to 250 tons are shown. Contains construction details, complete specifications, and graph showing range of operation.

American Hoist & Derrick Co.

379—Handling Retail Merchandise

Reprint of article from Automation magazine entitled "Handling Retail Merchandise". This is a case history of how a downtown St. Louis department store solved their merchandise handling problems through the use of Columbus McKinnon equipment. With text there is a schematic of system and photographs.

Columbus McKinnon Corp., Conveyor Div.

To order copies of the bulletins, please fill out the card between pages 2 and 3 or 58 and 59.

380—Chemical Processing Equipment

Bulletin G-3E described Fuller rotary compressors, vacuum pumps, coolers, preheaters, blowers, fans, exhausters, and pneumatic conveyor systems for handling dry, pulverized, granular and crushed materials. Photographs and operational line drawings. Capacity and rating tables are included.

Fuller Co.

381—Portable Airveyor Transfer Unit

This unit, designed for the transfer of pelletized or granulated plastics between loading and unloading points, is completely described in bulletin A-23. Also included are design and installation data, as well as a table of dimensions and capacities for standard units. Operating principle explained.

Fuller Co.

382—Water Storage

Graver offers a useful 2-page catalog sheet on the essential features of water storage tanks of every type. The information provided presents a quick summary of both new and basic forms and can be conveniently filed for ready reference. Diagram shows construction. Includes capacities and dimensions.

Graver Tank & Mfg. Co.

MECHANICAL POWER TRANSMISSION

383—Universal Joints

Catalog 61-D features complete line of single and double universal joints in a wide range of sizes and types for all industrial applications. Standards operate at speeds up to 1500 rpm and heavy duty joints to 1750 rpm. Horsepower .35 to 190 at 100 rpm. Available with boots. Also specials to order.

Lovejoy Flexible Coupling Co.

384—Flexible Couplings

Catalog 61-A features flexible couplings in a complete line of sizes and types for every service. Engineered for dependability, long service-life, minimum maintenance. Bore sizes range from solid to 9¾" and horsepowers from .003 to over 8500. Spider-type or individual type load cushions depending on hp.

Lovejoy Flexible Coupling Co.

385—Advances in Modern Gears

A 12-page bulletin which fully describes the advantages in using hardened and precision ground gears. Various applications such as radar-drive units, rotary-wing aircraft, high speed gas-turbine drives, dredge cutter drives, marine propulsion, and others are illustrated and their advantages discussed.

Philadelphia Gear Corp.

386—Turbine Pump Drives

Bulletin 31 describes Johnson's right angle turbine pump drives, in standard and combination drive installations, in a wide range of models to meet specific requirements of prime movers and pumps. Introduces new *Redi-Torq* automatic combination drive. Illustrations, power ratings, and average efficiencies.

Johnson Gear & Mfg. Co., Ltd.

387—Solid Shaft Gear Drives

Catalog 32 shows applications, specifications, and engineering details of right-angle solid shaft gear drives for centrifugal pumps and many industrial uses. Also describes *Redi-Torq* drive for use with auxiliary engine to automatically eliminate service interruptions due to power failure.

Johnson Gear & Mfg. Co., Ltd.

388—Universal Joints

Bulletin CS-10 describes and illustrates the five standard sizes of bevel gear universal joints available. For remote control of valves, pumps, engines, antennae, ventilators, equipment in inaccessible locations. Operate at any angle from 0° to 135° on vertical center line, or from 0° to 360° on horizontal center line.

Condenser Service & Engrg. Co., Inc.

MOTELS and HOTELS

389—Complete Hotel Services

Bulletin issued by Albert Pick Hotels and Motels describes the complete hotel services available in Albert Pick motels. Includes television in every room, attractive dining rooms, and playgrounds for children. Chain connected by teletype for immediate reservation service. Hotel and motel locations listed.

Albert Pick Hotels and Motels.

390—Alabama Convention Spot

Grand Hotel, with its adjacent Lakewood Golf Club, each year is host to numerous corporation board meetings and sales conferences, as well as to many smaller executive and golfing groups. For those desiring complete information we have a special convention kit. Delightful location, excellent cuisine.

Grand Hotel.

391—Minneapolis, Minnesota

Colorful booklet describes and pictures the facilities of the Pick-Nicollet hotel in Minneapolis. Ideal facilities for conventions, meetings, and trade shows. Services include PA systems, television, moving picture projection, and other special equipment in this 600 room hotel. Booklet shows modern decor.

Pick-Nicollet.

392—Point Clear, Alabama

Grand Hotel, Point Clear on Mobile Bay, Alabama, offers colorful booklet on the facilities they provide for the vacationer. An eighteen hole golf course has clubhouse with complete facilities for entertaining. Cruising, fishing, dancing, tennis, and swimming for recreation. Exquisite cuisine and flawless service.

Grand Hotel.

PIPING, VALVES & PLUMBING SUPPLIES

393—Flush-To-Wall Water Cooler

Form WC-15 describes Haws electric water cooler Model HWF-13, with detail drawings, capacities, accessories, and listing applicable government standards. Model HWF-13 mounts flush-to-wall with no waste space or exposed plumbing, using only 1⅛ sq ft floor space. Capacity of 12.5 gph serves 150 people.

Haws Drinking Faucet Co.

394—Insulating Union Meter Stops

Bulletin 9023 describes the Mueller insulating union gas meter stop. This effective electrical insulator is now available in the form of a union on five popular meter stops. The features of this insulating union and tests it has been subjected to are illustrated and described in detail.

Mueller Co.

395—Self-Cleaning "Y" Strainers

Bulletin 171 describes McAlear No. 530 and No. 530-G self-cleaning "Y" strainers. Installed in steam, air, gas, and oil lines to protect traps, instruments, and valves. Available in bronze, semi-steel, ductile iron, cast iron, and stainless steel. Includes specifications and cutaways showing construction.

McAlear Manufacturing Co.

396—Bronze Gate Valves

Bulletin E-165 describes Everlasting valves for general services. Classified index gives type, typical service, and page number. Distinctive features of Everlasting valves outlined and illustrated with cutaway and exploded view. Special arrangements, duplex boiler blow-off units and parts lists included.

Everlasting Valve Co.

397—Nonmetalic Pipe

Booklet describes Youngstown's *Fibercast* pipe for use where corrosion, pressure, and temperature are critical problems. Describes and pictures various applications. Gives many advantages of using *Fibercast* pipe. Outlines ease of handling. Offers complete line of fittings.

Fibercast Co., Division of the Youngstown Sheet & Tube Co.

398—Surge Arrestor Valves

Bulletin W-16 describes Golden-Anderson's cushioned surge arrestor valves. Design feature descriptions are keyed to line drawing showing construction. Arrangements for various types of controls are diagramed. Schematics of types of pilot valves show operation. Dimensions, parts list, and specifications.

Golden-Anderson Valve Specialty Co.

399—Ball Valves

Bulletin ADB-1001 describes Crane's new line of ball valves which feature exclusive tapered cartridge containing all working parts. Photographs show how cartridge slips out bottom, in one piece, while valve body remains in the line. Pressure and temperature ratings, sizes and other information.

Crane Co., Industrial Products Group.

400—Y-Type Pipe Strainers

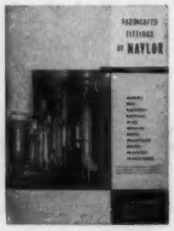
Bulletin 170 describes strainers fabricated from semi-steel, cast carbon steel, cast chrome moly WC6, forged chrome moly ASTM A-182 F22, bronze and stainless steel. Connections are screwed, flanged, butt weld, socket weld and silbraz. Different types of screens illustrated and described.

Armstrong Machine Works.

401—Flow of Liquids

Technical Bulletin 5 contains informative data on the laws governing the flow of liquids. This brochure relates primarily to the "n" value of sewer pipe, listing suggested values of "n" for Mannings formula. Describes Manning's formula in detail. Gives list of reference books for further information.

Clay Sewer Pipe Association, Inc.



402—Fabricated Pipe Fittings

Bulletin 525 illustrates standard and special fabricated fittings which help in planning piping and equipment layouts. Data includes specifications and prints on standard fittings for lightweight pipe. The bulletin also illustrates special fabrications designed to save time and labor. Suggested arrangements.

Naylor Pipe Co.

403—Glass-Lined Sewer Pipe

Folder deals with the glass-lined sewer pipe with a mechanical joint. *Amvit Glas-Glaz* pipe is available in 4-ft lengths. It is root and infiltration proof and is glass coated inside and out. The pipe has been designed for an under-the-house drain and also as a house-to-street sewer. Assembly operations shown.

American Vitrified Products Co.

404—UPVC Pipe Fittings and Flanges

Catalog 119 describes full line of pipe fittings, flanges and valves manufactured by Tube Turns Plastics, Inc., in unplasticized polyvinyl chloride and other industrial thermoplastic materials for low-cost handling of corrosive fluids and gases. Technical section gives complete engineering specifications and data.

Tube Turns Plastics, Inc.

PIPING, VALVES & PLUMBING SUPPLIES *continued*

405—Water Pipe Technical Manual

Bulletin 100 describes Southern Pipe's cement-mortar lined and mortar coated steel pressure pipe manufactured to Federal Specification INT. SSP-00385. Gives complete information on this specification. Design tables on all classes of pipe, 100 psig through 400 psig. Friction loss tables, deflection angles.

Southern Pipe Div., U. S. Industries, Inc.

406—Condensate and Oil Separators

Bulletin SC-77 gives complete data on new Strong cast iron separators. Dimensions, capacities, list prices, and operating details are shown. New separators are designed for installations in live steam lines where dry steam operation must be maintained. Horizontal or vertical pipe connections are available.

Strong.

407—Disc Valves

Bulletin describes Fairbank's bronze globe, angle, lift check, and stop and check valves with renewable composition discs. Construction is described and illustrated with cutaways. All types of valves offered are pictured. Specifications in tabular form include working pressures, valves sizes, and disc guide.

Fairbanks Co.

408—Wedge-Lock Clay Pipe

Bulletin R-359-87 describes Robinson's *Wedge-Lock* clay pipe. Shows how it provides tighter joints to resist roots and combat infiltration in the house, in the ground, and under basement floors. Installation procedures for *Wedge-Lock* factory-made joints are illustrated. Line of fittings pictured. Applications given.

Robinson Clay Products Co.

409—Bronze Ball Valves

Bulletin DH-38 describes new forged naval bronze ball valve with *Auto-mating* seats which insure positive seating. Bune "N" seats impregnated with molybdenum disulphide insure a slippery, non-galling surface. Wiping action of ball forces out foreign matter, prevents wear.

R-P&C Valve Division,
American Chain & Cable Co., Inc.

410—Cast Iron Pipe

Catalog of cast iron pipe, fittings, fire hydrants, water works gate valves. Specifications, dimensions, and weights of bell and spigot, mechanical joint, flanged pipe, and fittings covered. Mathews Modernized, Mathews Flanged Barrel, and R. D. Wood Swivel Joint fire hydrants described. Also Wood gate valves.

R. D. Wood Co.

411—Corrosion-Resistant Valves

Bulletin 236 describes a line of valves especially designed to control the flow of corrosive liquids. Lists metals and alloys, or combination, in which valves are available, pressure and temperature ratings, dimensions, and details of construction. Various kinds of valves illustrated. Cutaways show operation.

Wm. Powell Co.

412—Steam Trap Applications

Bulletin is technical article. Tells how flash steam recovery systems can save heat for use in a lower pressure steam system. Charts in tabular form give complete technical data. Table of dimensions is keyed to diagrams of standard flash tanks. Diagrams show single- and multi-stage flash recovery systems.

Yarnall-Waring Co.

413—Forged Steel Gate Valves

Descriptive data and specifications are now available on the Chapman 960B forged steel gate valve in a new brochure. Illustrates a group of entirely new features which assure longer operating life and simplified maintenance. Among the innovations is a new "bow-legged" yoke for easier access to stuffing box.

Chapman Valve Manufacturing Co.

414—Rubber-Lined Butterfly Valve

Bulletin 91.00 describes the Fisher-Continental replaceable liner butterfly valves, giving construction and sizing information. Also included is a pictoral explanation of the simple steps for replacing rubber liner. Standard and optional materials are specified with pressure and temperature limitations.

Continental Equipment Co.

415—Lawn Sprinkler Controls

Tork Bulletin 86 offers line drawings, schematics, and switching information on automatic controls for lawn sprinkling. Describes controls for both line voltage and low voltage valves. Units control one as well as multiple sections, and provide varied and individually-adjustable sprinkling times. How-to information.

Tork Time Controls, Inc.

416—Valve and Hydrant Manual

Catalog M612 provides complete description of Kennedy A.W.W.A. valves and hydrants combined with details of construction in exploded and cross section views. Also has all information necessary for installation, maintenance, inspection and repair, plus detailed specifications.

Kennedy Valve Mfg. Co.

PIPING, VALVES & PLUMBING SUPPLIES *continued*

417—Standard Steel Pipe

Bulletin SPA-035-760 describes standard continuous weld and seamless steel pipe for transmission of air, gas, steam, water, oil, and other fluids. Specified for commercial and industrial installations. Photographs show pipe being installed during construction. Complete specifications for various types of pipe.

Youngstown Sheet and Tube Co.

418—Gate Valves

Catalog H-2 provides information about the complete "Husky" line of carbon steel welding fittings for schedule 40 piping. Technical data is included for straight and reducing tees, concentric and eccentric reducers, 45° elbows, 90° elbows. Practical advantages of "Husky" fittings and performance tables.

NIBCO Inc.

419—Precision Control Valves

Catalog A243 describes all types of precision control valves manufactured by the Kohler Co. Cutaways and exploded views show construction and operation of various types of valves. Sizes and engineering data in table form is included. The many valve applications are listed. Branch sales office addresses given.

Kohler Co.

420—Insulated Piping Systems

The new edition of the Ric-wiL product catalog covers construction features for prefabricated, insulated piping systems for steam, hot water, oil, or refrigeration distribution lines. Types of systems covered include *Hel-cor, Uniline, Type J,* and cast iron. Prefabricated accessories are also included.

Ric-wiL, Inc.

421—Stainless Steel Fittings

This 22-page catalog explains how Speedline stainless steel fittings reduce piping costs by allowing the designer to take advantage of the new and more economical schedules 5 and 10 stainless steel pipe. A schematic drawing illustrates industrial applications.

Speedline Fittings Division,
Horace T. Potts Co.

422—Motorized and Magnetic Valves

Catalog V-61 describes Mercoid's magnetic and motorized valves for air, water, oil, gas, steam, and other industrial applications. Each type is illustrated, and specific application is given. Specification data includes type, service, pressure, body, seat, dimensions, and electrical requirements.

Mercoid Corp.

423—Laboratory Service Fittings

Engineers' Manual B describes laboratory, hospital, and school plumbing brass fixtures. Exploded views of water valves show sequence of components. Dimensional drawings on each type of fixture offered. Instructions on how to specify. List prices on all fixtures given. Also includes electrical fittings.

Water Saver Faucet Co.

424—Saran-Lined Piping Systems

Bulletin 157-145-61 describes *Saran*-lined pipe, fittings, valves, and pumps distributed by Saran Lined Pipe Company. Gives industrial applications, advantages, and dimensions. Fittings, valves, and pumps illustrated with photographs and schematics. Schematics show operation, construction.

Dow Chemical Co.

425—Valve Attenuators

Bulletin K-52 describes *Pneumavalve* by Connor Engineering Corporation, total constant volume high velocity valve attenuators. Includes features, controls, operation, performance data, dimensions, ratings, and specifications. Components of various assemblies detailed and illustrated. Drawings show dimensions.

Connor Engineering Corp.

426—Complete Plastic Piping Systems

Newest catalog from Kraloy/Chemtrol Co. describes complete line of non-corrosive plastic pipe, fittings, valves and pumps. Engineering data augment comprehensive coverage of products and services offered. Corrosion resistance data covers PVC I, PVC II, ABS, Penton, Polyethylene, Viton, and Buna-N.

Kraloy/Chemtrol Co.

427—Three-Way Mixing Valves

Bulletins V-214 ad V-215 describe pneumatically operated three-way valves for mixing liquids at different temperatures. Design provides constant total capacity, positive seating, allows straight-away piping hookup. Can be serviced without removing valve body. Sizes from 2½" to 6", pressures to 250 psi.

Johnson Service Co.

428—Valve Controls

Bulletin 1-60 fully describes the most popular type of *Limitorque* Valve Operator. What *Limitorque* is, does, and operates are clearly explained. Also, contained are complete dimensions and parts lists with drawings. Preferred mounting positions, operating tips and supplementary equipment illustrated.

Philadelphia Gear Corp.

PIPING, VALVES & PLUMBING SUPPLIES *continued*

429—Space-Saving Water Coolers

Bulletin WC-1003A describes GE's new space-saving shape in both wall- and floor-mounted water coolers. Information on how to determine water cooler size given in tabular form. Construction features and general specifications. Accessories are listed. Dimensions shown on diagrams. Bottle-type coolers included.

General Electric Co.

430—Pressure Pipe Line Strainers

Bulletin 6 illustrates and describes Nugent pipe line strainers for fuel oil, lubricating oil, and a wide variety of other fluids. Design, construction, and operation is explained and illustrated. Strainers may be furnished with magnetic separator. Specifications and capacity tables in chart form.

Wm. W. Nugent & Co., Inc.

431—Rubber Seat Ball Valves

Catalog BA-1 describes the new Pratt rubber seat ball valve in sizes from 10" through 48". Available in 150 psi and 250 psi designs. Features, applications, construction, and dimensions. Rubber seat provides bubble-tight closure and long life. Remarkably easy to operate. Manual, cylinder motor operators.

Henry Pratt Co.

432—Steam Traps

Bulletin 1400M describes steam traps for steam and air manufactured by the H. O. Trerice Company. Specifications are given on standard traps, blast traps, and cast steel traps in various sizes. Information on trap selection and tables of capacities. Cutaway show construction and operation. Exclusive features shown.

H. O. Trerice Co.

433—Complete Piping Service

Brochure describes services and manufacturing facilities of M. W. Kellogg Company. Kellogg will design, supply, and erect quality pressure piping as specified by you. Booklet outlines services in detail. Their modern equipment effect economies. Photographs show operation and fabrication methods.

M. W. Kellogg Co.

434—Drinking Fountains and Coolers

Catalog describes the Halsey Taylor line of stainless steel drinking fountains and electric water coolers. Wall, recessed and face mounted, bracket, counter, and floor types included. Diagrams show dimensions for all elevations. Specifications include capacity chart for all models. Phone and address of branch offices.

Halsey W. Taylor Co.

435—Saf-T-Seal Gate Valves

A completely new line of slab gate type ASA Gate Valves from W-K-M is described in Bulletin WS-1061. Using a pressure-actuated sealing principle entirely, the *Saf-T-Seal* Valve features through-conduit, full bore; steel seats with *Teflon* inserts; easy operation. Sizes, 2" through 36"; pressures to ASA 900.

W-K-M division of ACF Industries, Inc.

436—Duo-Check Valves

Bulletin 4161 describes *Duo-Chek* valve which performs all regular check valve duties, yet is smaller, lighter, easier to install. Space occupied as low as 4% and weight less than 10% of conventional check valve. No slam or water hammer. Sizes 2" to 48", ASA series 125 to 2500. Steel, stainless, aluminum, and bronze.

Mission Valve and Pump Co.

437—Snow Melting Systems

"Steel Pipe Snow Melting and Ice Removal Systems," 32 pages, presents the case for snow melting systems and shows typical installations in commercial and industrial locations. Design data is complete with information on anti-freeze mixtures, sizes, and spacing.

Committee of Steel Pipe Producers, American Iron and Steel Institute

438—Rubber Seat Butterfly Valves

Bulletin 6 describes Pratt's all new design of three types of rubber seat butterfly valves. Available sizes 3" to 144" with pressures from vacuum to 150 psi. Bulletin includes complete dimensions, information regarding operators, design features, cross sections, and technical data. Operation shown.

Henry Pratt Co.

439—Flexible Ball Joints

Bulletin 31A contains layout diagrams, photographs, and data on how to solve problems of thermal expansion and contraction in piping economically with flexible ball joints. Applicable to piping runs of any length and of any diameter from ¾ inch to 12 inches, including high temperature steel piping.

Barco Manufacturing Co.

440—Fiber Pipe and Fittings

Catalog No. 307 describes Orangeburg pipe and fittings and Orangeburg perforated pipe. Outlined are their many uses and advantages for underground non-pressure applications outside the dwelling. Pipe, fittings, and adapters are illustrated and accompanied by specifications.

Orangeburg Manufacturing Co.

PIPING, VALVES & PLUMBING SUPPLIES *continued*

441—Control Valves

Bulletin 70-275 describes the BS&B Super 70 Control Valves. Multi-colored diagrams show general flow pattern and construction of globe and angle valves. Various valve actuators in photographs and diagrams. Each type valve illustrated in multi-color drawings, showing operation. Industrial applications.

Black, Sivalls & Bryson, Inc.

442—Plumber's Brass Goods

Catalog PB-60 lists McDonald's complete line of plumber's brass goods. Each item is fully described and illustrated. Specifications include catalog number, size, weight, and pieces per carton. Includes valves of all kinds, sink sprays, copper tube fittings, gas cocks, steam stops, fill caps, and vents. Trade customs.

A. Y. McDonald Mfg. Co.

443—Fiberglass Drinking Fountains

Bulletin Cat-460 gives full details and specifications for Haws colorful fiberglass drinking fountains. Lightweight, wall-mounted models are vacuum molded, acid-resisting fiberglass. Color chart shows 6 permanent decorator colors available at no extra cost. Heat and pressure laminated; 1, 2, or 3 bubblers.

Haws Drinking Faucet Co.

444—Gear Operators

Bulletin AD-2441 describes Crane's new weatherproof *Converto-Gear®* operator for converting many Crane iron and steel gate valves to gear operation in less than 30 minutes. Shows dimensions and illustrates step-by-step procedure for installing unit on outside screw and yoke and non-rising stem gate valves.

Crane Co., Industrial Products Group.

445—Pipe Joints

Technical Bulletin 4, issued by the Clay Sewer Pipe Association, discusses various types of pipe joints. Important information as to general procedure included. Types of joints and jointing procedures are illustrated. Hot poured bituminous, precast bituminous, and wedge-lock joints are described in detail.

Clay Sewer Pipe Association, Inc.

446—Steam-Jacketed Valves

Bulletin E-200 describes Everlasting's steam-jacketed valves ideally suited to handling different types of viscous materials. Cutaway shows construction and operation. Exploded view shows components and arrangement of parts. Includes list of features, application photographs, and side and end views.

Everlasting Valve Co.

447—Drinking Water Coolers

Bulletin T-495 gives specifications, capacity ratings, and selection data on line of electric drinking water coolers. Models from 3 to 22 gph. Air cooled or water cooled condensing units. Wall mounted or wall flush types, explosion-proof, freezer-compartment, all stainless steel, hot and cold, remote models.

Temprite Products Corp.

448—Curb Valves

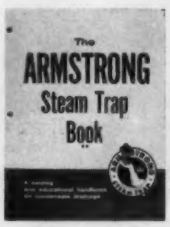
Bulletin 9010 describes the Mueller *Oriseal* curb valve. This ideal curb valve features easy turning after prolonged idleness, lifetime pressure sealing, long cycle life, and permanent lubrication without grease. Features are illustrated with full color cutaway and described. Specifications included.

Mueller Co.

449—Block Steel Valves

Bulletin 169 describes McAlear No. 37 and No. 38 block steel valves. Outlines service features, construction, operation pressures, and operation. Both models are illustrated. Line drawing shows construction and operating principles. Installation procedures detailed. Complete specifications tabulated. Ordering data.

McAlear Manufacturing Co.



450—Steam Traps

Catalog K describes Armstrong's steam traps. Gives pertinent general information. Lists features and gives complete details on various types of traps. Cutaways show operation, drawings show dimensions, and tables give specifications. Selection data includes capacity chart, graphs, tables, and drawings.

Armstrong Machine Works.

451—Jointed Vitrified Clay Pipe

Jointed vitrified clay pipe known as *Amvit*, with a built-in mechanical joint made from polyvinyl chloride, is described in four-page folder. Advantages such as infiltration prevention, quick installation, immediate backfilling, better flow, shock absorption, and quick testing in the field are pointed out.

American Vitrified Products Co.

452—All-Thermoplastic Ball Valves

Bulletin TTP180 describes new all-thermoplastic ball valve offered by Tube Turns Plastics, Inc. Features top-entry design for quick, easy maintenance plus positive flow control of corrosive fluids. These are furnished in unplasticized polyvinyl chloride or *Penton* in sizes ½" through 2". Other products pictured.

Tube Turns Plastics, Inc.

PIPING, VALVES & PLUMBING SUPPLIES *continued*

453—Nonmetalic Pipe Manual

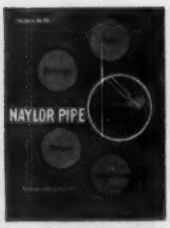
Manual SPA-043B gives technical and specification data on Youngstown's *Fibercast* non-metallic pipe. Complete specifications are charted on various sizes. Chemical resistance chart lists chemicals with recommendations at various temperatures. Tables, diagrams and graphs.

Fibercast Co., Division of the Youngstown Sheet & Tube Co.

454—Relief-Unloading Valves

Bulletin S-5 describes Golden-Anderson's cushioned automatic relief-unloading valves for steam, air, gas, and fluid control service. Includes pilot and main valve parts list, sequence of operation, installation procedures, flange dimensions, specifications, and list of materials used in components.

Golden-Anderson Valve Specialty Co.



455—Lightweight Pipe and Fittings

New 8-page condensed catalog summarizes complete line of Naylor light-weight pipe, fittings, flanges, and connections. Lists typical applications. Includes standards specifications on pipe from 4 to 30 inches diameter, together with details on standard fittings and flanges. Covers couplings for pipelines.

Naylor Pipe Co.

456—Metal Plastic-Lined Valves

A two-page illustrated circular, Form 240, covers a new line of metal, plastic lined valves recently introduced by Powell. Although usually cast carbon steel, valves in other alloys can be supplied on order. All interior or wetted parts are protected by one of several heavy plastic linings.

Wm. Powell Co.

457—Bar Stock Valves

Bulletin DH-766-B gives complete information on K-P&C bar stock valves. Available in a range of metals and sizes for applications requiring close control valves capable of withstanding a wide range of working temperatures and pressures. Completely illustrated.

American Chain & Cable Co., Inc. R-P&C Valves Division.

458—Tilting Disc Check Valves

Catalog 30-C describes Chapman's tilting disk check valves as differing radically from standard type check valves, eliminating slamming and wear of moving parts and substantially reducing friction losses. Made in iron, bronze and steel, models are available for working pressures to 6000 psi, sizes to 72" dia.

Chapman Valve Manufacturing Co. . . .

459—Steam Specialties

Catalog 75 contains complete information on Strong's expanded line of steam traps, line strainers, separators, pressure regulators, and reducing valves. Complete information, specifications, and list prices are included along with detailed capacity and sizing charts, line drawings and photographs.

Strong.

460—Bronze Globe Valves

Bulletin V-525 describes Fairbank's bronze globe and angle valves with Brinell stainless steel full plug discs and seats for 150, 200, and 300 lb services. All types of valves are illustrated. Cutaways show construction. Recommends types of valves for pressures, temperatures, and material to be handled.

Fairbanks Co.

461—Unit Tandem Blow-Off Valves

Bulletin B-435, Supplement A-1, describes unit tandem blow-off valves for boiler pressures to 665 wsp. Cutaways and line drawings show construction and operation. Materials used in various parts of valve listed. Table of dimensions keyed to diagrams. Information on how to specify and order included.

Yarnall-Waring Co.

462—Wedge-Lock Type "O" Joint

New Robinson *Wedge-Lock* Type "O" joint for vitrified clay pipe is described and illustrated in folder R-460-110. Solves many water handling problems. Specifications of the new joint as well as testing methods used are detailed in the folder. Suggestions on specifying Type "O" joint also included.

Robinson Clay Product Co.

463—Mortar Lined and Coated Pipe

Southern Piping, publication of Southern Pipe Division of U. S. Industries, Inc., annuonces that cement mortar lined and reinforced mortar coated steel pipe became government improved with the issuance of Interim Federal Specification SSP-00385. Southern Pipe's *Steelcor Cemcote* meets every requirement.

Southern Pipe Div. U. S. Industries, Inc.

464—Valve Maintenance Manual

Catalog M601 shows the complete line of Kennedy Underwriters' Approved hydrants, valves and indicator posts along with detailed information selection, installation and maintenance. Cross section and exploded views show components in order of construction and operation. Complete specifications.

Kennedy Valve Mfg. Co.

PLANT SITES

465—New York State Plant Locations

Bulletin "At Your Command" describes plant location services offered by the Niagara Mohawk Power Corporation. Services include inventory of available industrial sites and buildings. Offer detailed analysis of community facilities, taxes, government, and other important characteristics. No cost or obligation.

Niagara Mohawk Power Corp.

466—New York Industrial Facilities

Comprehensive booklet on industrial facilities available in Upstate New York. Describes availability of produce markets, general labor supply, and availability of skilled supervisory and professional labor. Offers world market via waterways. Graphs show manufacturing and small business expansion.

Niagara Mohawk Power Corp.

467—Industrial Opportunities

A colorful new presentation of Colorado's industrial opportunities. Included are booklets on manufacturing, power, raw materials and resources, transportation, markets and labor, Colorado living, industrial site locations, state highway map, and full color recreation booklet. Up-to-the-minute data in portfolio form.

Colorado Department of Development.

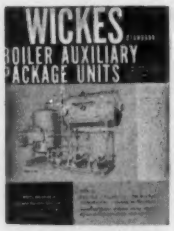
To order copies of the bulletins, please fill out the card between pages 2 and 3 or 58 and 59.

POWER EQUIPMENT & FUELS

468—Mechanical Drive Turbines

Worthington's bulletin 4850-B2 covers multi-stage mechanical drive steam turbines up to 15,000 rpm and 50,000 hp. Cutaways show single and multi-flow exhaust machines in detail. Isometric drawing illustrates automatic gland control system and explains its operation. Several control systems are diagramed.

Worthington Corp.



471—Boiler Auxiliary Packaged Units

Bulletin 59-1 describes auxiliary package units available for boilers of 10,000 to 100,000 lbs steam per hour, steam pressure to 300 psig. Units have various combinations of deaerating feedwater heaters, boiler feed pumps, condensate surge tanks to reduce maintenance and to increase plant efficiency.

Wickes Boiler Co.

469—Incinerator Stoker

The Combustion Engineering incinerator stoker is completely described in Catalog IS-1. Various schematic drawings of several designs of units are featured. Firing methods, performance records and the many advantages of incineration are covered in detail. Closeup photographs show grate surface design.

Combustion Engineering, Inc.

472—Coal-Fired Packaged Boilers

Bulletin 1100 describes *Coal-Pak* automatic generators developed in conjunction with Bituminous Coal Research, Inc. Features complete combustion controls, automatic coal feed and ash removal for burning low cost bituminous coal cleanly and efficiently. Complete engineering information is given.

International Boiler Works Co.

470—Engine Power Rating Chart

Bulletin 1079-K is a power rating chart, giving a complete tabulation of horsepowers, speeds, and loads for Waukesha engines and power units. Lists engine and power units operated by diesel, LP gas, gasoline, and natural gas fuels. Concise and easy to read, punched and ready for insertion in loose-leaf binder.

Waukesha Motor Co.

473—Power Units

Bulletin 40-20446 will assist in the selection of power equipment which will operate over the longest period of time at the lowest cost. Discusses turbochargers and aftercoolers, as well as fuel systems. Compares in text and drawings 2-cycle and 4-cycle design. Drawings and cutaways illustrate booklet.

Caterpillar Tractor Co.

POWER EQUIPMENT & FUELS *continued*

474—Scotch-Type Packaged Boilers

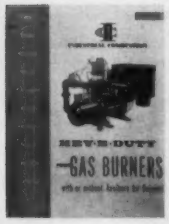
Catalog AP-401 illustrates and describes Pacific's Scotch Type 20-60 hp packaged boilers. Contains dimensions and engineering data. Boilers are built and tested in accordance with ASME Code requirements and are complete with metal jackets, dual-fuel burners, forced draft design, one-piece flue door.
Pacific Steel Boiler Div. of Crane Co.

475—Completely Packaged Boilers

Superior packaged boilers, both fire-tube and water-tube are described in this new catalog. Designed for capacities from 20 to 600 bhp in the fire-tube line, from 4,000 to 61,000 lb/hr in the water-tube line, and all firing gas, oil or both. Superior packaged boilers are backed by undivided responsibility.
Superior Combustion Industries Inc.

476—Heat Recovery Snubbers

Bulletin 272 describes the Burgess-Manning heat recovery snubbers that employ standard weight pipe coil as the water carrier and heat transfer surface, and two-chamber snubber for silencing. Bulletin contains cutaway drawings, engineering diagrams, specifications tables, photographs, heat transfer nomographs.
Burgess-Manning, Industrial Silencer Div.



477—Power Gas Burners

Bulletin 2 describes Industrial Combustion's Hev-E-Duty power gas burners, with or without auxiliary oil burners. Series of burners range from 720,000 Btu to 21,000,000 Btu. Controls, boiler capacities, and radiation tables included. Made in gas only, combination light oil and gas, combination heavy oil and gas.
Industrial Combustion, Inc.

478—Underfeed Stokers

Catalog No. 401, fully illustrated, gives complete data on double retort underfeed stoker. This stoker is built for heavy duty service in the intermediate size range for boilers of about 20,000 pounds to 34,000 pounds of steam per hour capacity. Burns nut, pea and slack, or crushed run of mine bituminous coals.
Detroit Stoker Co.

479—Packaged Boilers

Cleaver-Brooks catalog AD 178 describes complete C B line of boilers built with unique hinged doors and fully automatic controls. Advantages of four pass, forced draft design, 5 square feet of heating surface per boiler horsepower for the CB models, 15-600 hp., oil, gas or combination fired are described.
Cleaver-Brooks Co.

480—Packaged Steam Generators

Bulletin PG-61-1 describes Foster Wheeler's automatic packaged boilers, oil or gas fired, available in capacities from 13,000 to 100,000 lb per hr with design pressures from 250 to 1350 psi. Cutaway drawing and diagrams show construction. Capacities and dimensions in tabular form. Optional equipment listed.
Foster Wheeler Corp.

481—Two-Bed Packaged Demineralizers

Bulletin ADC4-1001-461 is on the new two-bed *Uni-Pac* line of demineralizers. Demineralization and uses of demineralized water explained. Capacities tables of standard units. Illustrates manually operated and automatic-controlled type. Plan and elevation drawing is keyed to dimension tables.
Cochrane Division, Crane Co.

482—Heat Recovery Silencers

An informative 24 Page illustrated technical article on Utilization of Waste Heat from Internal Combustion Engines. Schematic layouts are used to illustrate various applications. Cutaways show construction and operation. Included are specifications descriptions to assist in developing bids.
J. B. Beaird Co., Inc.

483—Positive Flow Packaged Boilers

Bulletin 1275 describes Orr & Sembower's new positive flow boiler. Boiler has been tested and proven by a famous consulting engineer firm. Design permits both feed injection and natural thermal circulation to augment each other thus providing maximum circulating rate and most efficient form of heat transfer.
Orr & Sembower, Inc.

484—Feedwater Deaerators

Bulletin 575-A explains continuous boiler feed water deaeration under .005 cc/liter without vent loss or adjustment, over a 10-to-1 load swing, without sodium sulphite. Illustrates operating principle and components. For boiler plants with capacities from 3,000 to 125,000 lbs/hour. Specifications are included.
Fred H. Schaub Engineering Co.

485—After Coolers

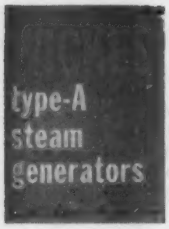
How aftercoolers remove moisture from compressed air and gas is explained in bulletin 130. Schematic flow diagrams show how aftercoolers can cool and dry compressed air systems in a plant. This eight-page, three-color bulletin is profusely illustrated. Full line of air engineering equipment shown on last page.
Niagara Blower Co.

POWER EQUIPMENT & FUELS *continued*

486—Geared Turbine Generators

Bulletin 4830-B1 describes Worthington's Geared Turbine Generators. Bulletin covers flexibility, design, controls, governing systems, lubrication, gears and cooling arrangements. Governing system is represented schematically. Information helps you select either single-stage or multi-stage turbines.

Worthington Corp.



487—Steam Generators

Wickes type-A steam generators, compact, efficient, shop assembled water tube boilers, are illustrated and described in catalog 56-1. It gives typical superheater arrangements for the boilers with section, plan, and side views of drainable "S," pendant, and drainable superheaters. Specifications are given.

Wickes Boiler Co.

488—Hot Water Boilers

Bulletin HCC-2, a 20-page brochure, describes and illustrates the design, construction, advantages, and economies of the C-E LaMont controlled circulation hot water boiler for supplying high pressure, high temperature water for heating systems and process applications. Comparison table of heat content.

Combustion Engineering, Inc.

489—Diesel Engines

Bulletin 40-20436 describes the Cat D343 model T, turbocharged, and model T/A, turbocharged-aftercooled. Components and features described and illustrated. In combination with electric generators, up to 250 kw. A wide range of standard attachments may be applied to your specific application. Illustrated.

Caterpillar Tractor Co.

490—Packaged Boilers

Catalog AD137 describes packaged boilers for heating and processing. Advantages of four-pass, forced draft, oil, gas or combination fired included. Cutaway shows construction and line drawings show operation. Complete specifications, dimensions, layout guides. Fire-tube and water tube boilers illustrated.

Cleaver-Brooks Co.

491—Dealkalizing Salt Splitter

Bulletin 4567 explains dealkalizing salt splitter used in process and boiler feedwater. Following a sodium zeolite softener, it utilizes a strong basic resin that splits the salts in water, substituting the chloride ions for bicarbonate, carbonate sulphate, and nitrate ions. Bulletin includes flow diagram.

Cochrane Division, Crane Co.

492—Engine-Generator Combinations

Bulletin SA-626 Climax V-12 Series Industrial *Enginators*, the engine-generator combination. Operates on natural gas, sewage gas, LPG, or gasoline. Shows graph of fuel rate and chart of capacities. Includes engine specifications and standard accessories, generator specifications and controls. Schematics and dimensions.

Climax Engine Mfg. Co.

493—High Temp Water Generators

High temperature water generators for single and multi-story buildings are described in bulletin 1900 on International-LaMont *Thermojet* Generators. Bulletin explains LaMont principle of forced recirculation which permits temperature differentials to 200°F, with no thermal shock. Compact construction.

International Boiler Works Co.

494—Baseless Packaged Boilers

Bulletin ADJ-0025 illustrates and describes Pacific "400" Series Baseless packaged boilers for forced draft firing. Dimension and engineering data. Costly refractory and installation and maintenance eliminated. Boiler, burner, and platform are factory assembled and tested. Construction comparisons shown.

Pacific Steel Boiler Div. of Crane Co.

495—Waste Heat Recovery

Bulletin WHB 59-3 describes the economic utilization of excess heat developed from diesel exhaust gases and industrial and chemical processes. Specific industrial, marine, and chemical applications of varying capacities and services are illustrated. Advantages of bare tube and extended surface designs are noted.

Foster Wheeler Corp.

496—Packaged Hot Water Boilers

Type CC Superior packaged hot water boilers firing gas, oil, or both are described in this catalog. Capacities from 670,000 to 11,720,000 Btu/hr and equipped with newly developed *Venturi-action* mixing tube, Type CC has four passes, 5 sq ft of heating surface per bhp, and induced draft.

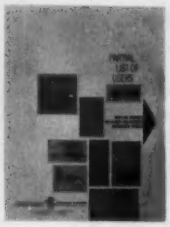
Superior Combustion Industries Inc.

497—Maxim Silencer Handbook

Catalog describes Maxim Silencers, proven in performance for every use. Exhaust, intake, air jacketed, high velocity steam, air discharge, spark arrestor, heat recovery, and marine engine wet exhaust silencers are listed in catalog. Information includes model number, and available sizes.

J. B. Beaird Co. Inc.

POWER EQUIPMENT & FUELS *continued*



498—Burners and Boilers

Check-list IC-169 in book form gives locations of *Hev-E-Oil* Burners, *Hev-E-Duty* Gas Burners, and New Highlander Automatic Boiler-Burners in use in 1961. The list is categorized into types of installations, geographical locations in the U. S. and Canada. Product information is also included.

Industrial Combustion, Inc.

499—Air Intake Cleaner Silencers

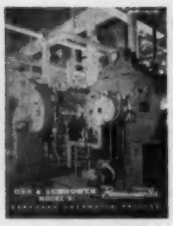
Bulletin 273 describes the Burgess-Manning combination air intake cleaner and silencer snubber widely used in all branches of industry on the intakes of internal combustion engines, compressors, turbines, and blowers. Bulletin contains details of design and construction and cross-section drawings.

Burgess-Manning, Industrial Silencer Div.

500—Incinerator Stoker

Bulletin 701 presents for the first time a new reciprocating grate stoker for use in municipal and industrial incinerators. Standard modular units provide maximum flexibility of application at minimum installation cost. Ingenious design assures higher burning rates and greater efficiency, less attendant labor.

Detroit Stoker Co.



501—Oil and/or Gas Fired Boilers

Bulletin 1260 describes and illustrates *Powermaster* Model 3 line. Includes gas, oil, and combination gas/oil models, a new specially designed hot water boiler, and the new stream atomizing principle for use with No. 6 oil. Ratings and dimensions of all sizes in line are included. Cutaway shows operation.

Orr & Sembower, Inc.

502—Gas Turbine Engines

Booklet describes Solar's gas turbine engines, a small, light, and efficient source of power. Run on a wide variety of fuels. Text with diagram shows how they work. Complete engine data, including charts and graphs, are given on each model. Diagrams show operation and construction. Applications listed.

Solar Aircraft Co.

503—Forced-Draft Gas Burners

Bulletin B14 describes in detail the Webster *Dynetic* forced-draft gas burner. Gives features, standard operation, and special models available. Tabular dimensions are keyed to drawing. Complete specifications are included. Typical installation is illustrated with cutaway with instructions keyed to drawing.

Webster Engineering Co.

504—Vented Deaerators

Bulletin 1300 explains simple, fully vented deaerator that assures positive, economical oxygen removal to .03 cc/liter from feed water, heating equipment, and return lines. Illustrates operating principle and components. For boiler plants with capacities from 1,000 to 30,000 lbs/hour. Representatives listed.

Fred H. Schaub Engineering Co.

505—Induced Draft Fans

Bulletin L-3 describes Lehigh's line of centrifugal induced draft fans. Covers rating tables shown at 600°F, dimension data, and construction material specifications. Recommends sizes of fans for oil, gas or coal fired boilers. Includes typical installations and photographs.

Lehigh Fan & Blower Division, Fuller Company.

506—Packaged Direct-Fired Heater

Bulletin 40-110 gives specifications, industrial applications, illustrations, advantages of *Q-Pak* heater. Both in once-through and recirculating applications requiring outlet air temperatures of 200° to 3,000° F. Standard units supply 100,000 to 10,000,000 Btu/hr heat release and heated air 4,650 to 1,082,000 scfh.

Black, Sivalls & Bryson, Inc.

507—Gas-Fired Air Makeup Units

Belt-driven and direct-connected units, featuring self-contained package construction, offered in a wide range of sizes, capacities, and Btu/hr ratings for all sizes of areas and types of structures. Bulletin 860 contains complete data on burner and control assemblies with illustrations and installations.

Aerovent Fan Co., Inc.

508—Forced-Draft Burners

Bulletin describes compact forced-draft package unit burner. This single, coordinated, factory-tested assembly, ready for attachment to boiler, combines all necessary equipment for burning oil or gas fuels. Gives details of design and features. Diagrams are keyed to chart giving dimensions for all models.

S. T. Johnson Co.

509—Compressed Air Filters

Catalog 6000 covers compressed air filters of 20 to 200 scfm capacity that remove all harmful traces of dirt, water and oil down to 2 microns or less, go months without maintenance. Describes new, exclusive scrub-and-polish action with cleaning-by-coalescence. Lists models for all needs, ¼" to 2" pipe size.

King Engineering Corp.

POWER EQUIPMENT & FUELS *continued*

510—Internal Combustion Engines

Catalog EN303 describes 4-cycle, short-stroke, air-cooled internal combustion engines manufactured by Kohler Company. Each model is illustrated. General specifications, dimensions, and various applications given. Use of engines in various types of equipment are shown in photographs. Other Kohler products.

Kohler Co.

511—Water Gate Hoists

Catalog GH-353 describes gate hoists specifically designed to control water levels on hydro-electric power plant installations. Illustrates some typical hoists. Lists types of stationary and traveling gate hoists and the types of power dam gates for which they are applicable. Capacities from 1 to 100 tons.

D. J. Murray Manufacturing Co.

PUMPS & COMPRESSORS

512—Submersible Pump Manual

Bulletin 1000 contains complete information about Pleuger submersible pumps, motors, and unique pump accessories. Installation procedures, testing methods, and unusual applications of submersible pumps are described. Sizes from 1/3 hp to 1000 hp, capacities from 5 gpm to 50,000 gpm.

Pleuger Pump Manufacturing Co.

516—Rotary Pump Installation Manual

Manual TS-9A gives detailed information on the correct installation of rotary pumps. Line drawings illustrate each step in the procedure. Includes what-to-do pointers on noise, pump fails to pump, wears rapidly, insufficient capacity, and too much power. Gives twenty pointers for better performance.

Viking Pump Co.

513—Vertical Turbine Pump

Bulletin 1032 describes features of Johnston's "Type C" line of industrial pumps, designed to operate at heads to 1200 ft, with capacities to 12,000 gpm, and at temperatures to 600°F. Principal applications include suction booster, pipe line, power plant, refinery, and municipal booster service and bulk plant transfer.

Johnston Pump Co.

517—Dry Pit Nonclog Pumps

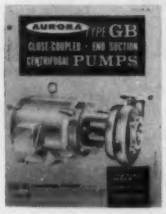
Bulletin 1850.5A describes Pacific's dry-pit non-clog sewage pumps, featuring the newly designed suction elbows on vertical models. Vertical and horizontal models are illustrated and described. Cutaway shows construction. List of components is keyed to schematics. Each functioning part is detailed.

Pacific Pumping Co.

514—Rotary Positive Blowers

Bulletin S-32A describes how a rotary positive displacement blower delivers a metered amount of air against varying pressures with a minimum amount of friction. Design features and operating principles are discussed, as well as dimensional and performance data for vertical and horizontal models.

Sutorbilt Corp., Subsidiary of Fuller Co.



518—End Suction Centrifugal Pumps

Bulletin 108 describes the new high efficiency, low horsepower Aurora Type GB close-coupled, end-suction centrifugal pumps. Cutaway shows construction and operation. Typical applications given. Selection chart simplifies specification. Dimension chart gives sizes for various pumps. Schematic and parts list.

Aurora Pump Division.

515—Industrial and Municipal Pumps

Bulletin 100 describes Layne & Bowler *Verti-Line* pumps for industrial and municipal primary water supply. Table shows range of conditions which can be accommodated by these pumps. Also includes table of head-capacity range in relation to horsepower. Line drawings show head assemblies, typical systems.

Layne & Bowler Pump Co.

519—Vertical Condensation Pumps

Bulletin 21-C describes Skidmore's Type CCVS vertical condensation pumps. Features of the pump are listed along with construction data. Duplex unit with two float switches and duplex unit with automatic alternator is illustrated. Diagrams are accompanied by tables of engineering data and dimensions.

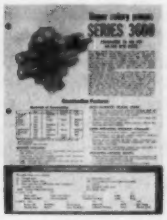
Skidmore Corp.

PUMPS & COMPRESSORS *continued*

520—Pumps for Every Application

Bulletin issued by Byron Jackson shows their complete line of pumps in a condensed form. Each pump they offer is illustrated and described. Specifications on each include temperature, capacities, heads, pressures, and speeds. Special purpose pumps can be designed to your specifications.

Byron Jackson Pumps, Inc.



521—General Purpose Rotary Pumps

Latest tables, diagrams, dimension drawings, and photographs of entire series are included in catalog F-4177. Shown are examples of bedplate-mounted, gasoline engine and electric motor driven units. Information about lightweight Fig. 1809 and Fig. 3638 models for petroleum and process fields.

Roper Hydraulics, Inc.

522—Submersible Pumps

Bulletin B-259 describes the new design of the Super-Sumo submersible pump for 4" and larger wells. Designed for economy installations, the pump features bronze and stainless steel construction for corrosion resistance, long life, and maximum pumping capacity. Sizes from ⅝ hp to 1½ hp, capacities to 1700 gph.

Sumo Pumps, Inc.

523—Pump Application Guide

Bulletin APEB-100.17B, a condensed application guide for Fairbanks-Morse pumping equipment. Contains quick selector guide and index. Pumps illustrated, specifications given, maximum ratings and dimensions in tabular form. Facilities for handling all viscosities, temperatures, and solids. District offices.

Fairbanks, Morse & Co.

524—Non-Clog Sewage Pumps

Bulletin 800 provides information on specifying, selection, installing, and operating Weinman Type M-VS vertical submerged non-clog sewage ejectors for pumping drainage from low to higher level. This bulletin also includes drawings, charts, selection tables, and details of accessories for all models.

Weinman Pump Manufacturing Co.

525—Pump Manual

Manual TS-12A, published by Viking Pump, is a manual for LP-Gas and Anhydrous Ammonia pumps. General information includes construction, lubrication, rotation, adjustments, and other data. Complete instructions on installation include diagrams, schematics and photographs. Many charts and graphs.

Viking Pump Co.

526—Submersible Sump Pump

Catalog 259 describes the complete line of *Enpo* submersible pumps and accessories. It shows data on design, construction, performance, operation, a listing of standard models and capacities of each. Recommendations for installation and suggested applications are also shown. All ratings are specified.

Piqua Machine & Mfg. Co.

527—Primary and Secondary Pumping

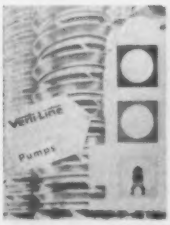
A completely automatic system for year round temperature control of a large multi-zoned building can present challenging design problems. A helpful solution "Zone Control with the B&G System of Primary and Secondary Pumping" is presented in an interesting 24-page design manual. Diagrams show systems.

Bell & Gossett Co.

528—Packaged Gas Compressors

White Diesel's new line of medium speed, heavy duty gas compressors, matched with its Superior gas engines, are described in Bulletin 124. Of balanced-opposed design, line contains 2, 4 and 6 cylinder models, ruggedly built for the 200-1000 bhp range.

White Diesel Engine Div., White Motor Co.



529—Close-Coupled Industrial Pumps

Bulletin 1100 describes Layne & Bowler's *Verti-Line* close-coupled industrial pumps. Capacities from 20 gpm to 30,000 gpm, heads to 600 psi. Features illustrated and described. Line drawing shows components, and cutaway shows construction. Head-capacity range table, material specifications, and photographs.

Layne & Bowler Pump Co.

530—Vertical Mixed Flow Pumps

Bulletin 1040 gives details on newly expanded mixed flow line designed to fill the vital gap with lifts 20 to 80 ft and capacities to 150,000 gpm. Describes applications and discusses system design considerations, including sump construction and trash racks, plus standard materials of construction and dimensions.

Johnston Pump Co.

531—Rotary Compressors

Bulletin ACO 100.4 describes a new heavy-duty rotary compressor for general purpose services, including those requiring delivery of oil-free air, gas, or vapor. Performance coverage, capacity up to 21,000 cfm, pressure up to 250 psig. Foremost applications in chemical, petro-chemical, and heavy industries.

Fairbanks, Morse & Co.

PUMPS & COMPRESSORS *continued*

532—Pumps for Abrasives and Acids

Seven new bulletins are available covering Denver SRL pumps ranging in size from 1¾" x 1" to 12" x 10". Denver SRL pumps are rubber lined and are designed to handle sands, abrasives, and acids. Bulletins incorporate specifications, capacities, power requirements, and dimensions for pump layouts.

Denver Equipment Co.

533—Frame-Mounted Unipumps

Bulletin 200 describes in detail the full line of Weinman Types ACB and AEB frame-mounted *Unipumps* for general service pumping, pressure boosting, and hot or chilled water circulation. The six-page bulletin also features a complete pump selection table as well as dimensions and engineers' specifications.

Weinman Pump Manufacturing Co.

534—Pumps and Blowers

California series rotary positive, gas pumps and vacuum pumps are described in bulletin S-59I with dimension drawings and capacity tables. For volumes up to 2480 cfm single stage with pressures to 10 psi or vacuums to 20 in. Hg. Many features detailed. Typical field applications. Drawing shows operation.

Sutorbilt Corp., Subsidiary of Fuller Co.

535—Close-Coupled Industrial Pumps

Bulletin 1100 describes Layne & Bowler's *Verti-Line* pumps for every industrial vertical pump installation. Head-capacity range table makes pump selection simple. Material specifications for various components. Line drawings and cutaways show construction and operation. Typical installations illustrated.

Layne & Bowler Pump Co.

536—Condensate Return Pumps

Bulletin 19-B describes Skidmore's type UV pumps designed for return of condensate to the boiler from steam heating systems or process equipment. Bulletin contains structural specifications and engineering data and capacity tables. Diagrams are accompanied by charts of dimensions and weights.

Skidmore Corp.

537—Quiet Rotary Pumps

Revised performance tables for ten sizes, outline photos of nine models with dimension drawings, installation photographs, cross section drawings of relief valve, mechanical seal, and packed box are provided in catalog F-4176. Tables, outline photographs, and dimensional drawings also given for Series KE.

Roper Hydraulics, Inc.

538—Gas Turbine Compressors

Bulletin describes Solar's centrifugal gas turbine compressors for gas compression and general industrial use in the low volume range up to 1500 psi. Multiple unit installation illustrated. Charts simplify proper selection for specific application. Examples of use. Specifications with dimensional diagram.

Solar Aircraft Co.

539—Centrifugal Pumps

Consultants interested in pumps for many different applications will find bulletin 52C6059Q a valuable reference. Whether you need a pump for handling clear liquid, corrosive or abrasive liquids, or liquids containing solids in suspension, there are 17 different types. Pumps 10 to 250,000 gpm.

Allis-Chalmers.

To order copies of the bulletins, please fill out the card between pages 2 and 3 or 58 and 59.

540—Water Flood Pumps

Bulletin 1-1710 describes Byron Jackson's injection pumps, water supply pumps, oil well pumps, booster pumps, and transfer pumps. Offer complete line of oil repressurization pumps and show flow diagram of system. Each type of pump is illustrated and general specifications given. Engineering service locations.

Byron Jackson Pumps, Inc.

541—Wet Pit Nonclog Pumps

Bulletin 1850.2A describes Pacific's wet-pit non-clog pumps providing efficient, economical, and dependable service pumping sewage. Complete specifications on all components. All pumps are illustrated. Typical duplex wet-pit installation is pictured. List of components is keyed to construction diagrams.

Pacific Pumping Co.

542—Deepwell Submersible Pumps

Bulletin B1400 gives performance data and illustrates major features of Sumo high capacity 3550 rpm and 1750 rpm pumps from 600 to 3400 gpm, for industrial, commercial, and municipal water supply and booster service. Cutaways show features and construction. Specifications and special applications.

Sumo Pumps, Inc.

PUMPS & COMPRESSORS *continued*

543—Split Case Centrifugal Pumps

Bulletin 105C describes the complete line of Aurora single stage, double suction, horizontal split case centrifugal pumps. Cutaways show construction and operation. Typical applications are given. Selection chart makes it easy to specify the proper pump for a specific job. Parts list and dimensional data.

Aurora Pump Division.

544—Submersible Propeller Pumps

Bulletin 2000 is one of the first of its type which describes the unique adaption of the propeller pump to submersible applications. The design has economical advantages when moving great amounts of water for irrigation, dewatering projects, and water supply. Capacities from 500 gpm to 50,000 gpm.

Pleuger Pump Manufacturing Co.

STRUCTURAL MATERIALS & EQUIPMENT

545—Masonry Wall Reinforcement

Bulletin by Dur-O-waL describes wall reinforcement and *Rapid Control Joints.* Includes advantages, description, physical properties, section table, and general specifications for solid masonry wall construction. Line drawings show application. Drawings and specifications on both types of *Rapid Control Joints.*

Dur-O-waL.

548—Complete Structural Systems

Bulletin describes Stran-Steel's complete lightweight steel system with fully integrated cold formed structural sections. Contains information on joists, studs, channels, columns, beams, rigid frames, zee sections roof deck, ribbed decking, and curtain wall. Includes patterns, dimensions, and properties.

Stran-Steel Corp.

To order copies of the bulletins, please fill out the card between pages 2 and 3 or 58 and 59.

549—Prestressed Strand and Wire

From a pioneer in the prestressed concrete field comes a new catalog entitled "USS American Wire and Strand for Prestressed Concrete." The important phases and applications of prestressed concrete and the role American Super Tens Wire & Strand play are shown.

American Steel & Wire Division of United States Steel Corp.

546—Heavy Construction Fasteners

Bulletin 160 covers large fasteners for the heavy construction and machinery industries. Large forged standard and special purpose nuts, bolts, threaded rods, loop rods, eye bars, construction accessories, size 1¾ in. thru 12 in. bolt diameter. Illustrated with photographs of standard and special large fasteners.

Jos. Dyson & Sons, Inc.

550—Safety Grating

Catalog 5911 describes Globe's *Grip-Strut* safety grating available in steel, aluminum, and stainless steel. Complete information includes features, advantages, types of loading, load charts, material specifications, stair treads, installations, and special applications. Contains data on *Golden Nugget* welded grating.

Globe Co.

547—Alloy Steel Structural Shapes

Bulletin ADUCO-01102-60 describes the quenched and tempered structural shapes of such alloy steels as USS "T-1", "T-1" type A, 9% nickel and HY 80. A listing of the shapes available, beams, channels, and angles, together with their sizes and weights per foot, is included. Mechanical properties and chemistry are given.

United States Steel

551—Commercial Glass Properties

Bulletin 83 is a reference guide to the properties of over 32 selected commercial glasses. Contains 16 pages of text, tables and graphs giving an authoritative discussion of glass, its optical qualities, corrosion resistance, electrical properties, heat transmission, mechanical properties, and other properties.

Corning Glass Works.

STRUCTURAL MATERIALS & EQUIPMENT *continued*

552—Masonry Reinforcing Tie System

Report No. 60-1 by the Building Officals Conference of America, Inc. gives approval of that body to the *Econo-Lok* reinforcing tie system for masonry wall construction. Includes application and supporting data; description and use of product. Gives complete results of structural tests and recommendations.

AA Wire Products Co.

553—Steel and Aluminum Grating

This 16-page catalog shows the three basic types of grating construction; gives more than 30 dimensional drawings of subtypes; eight safe load tables covering steel and aluminum grating, roadway grating, and sidewalk slabs; tables on panel widths, tread widths, and floor armor. Planning layouts are given.

Borden Metal Products Co.

554—Steel Welding Equipment

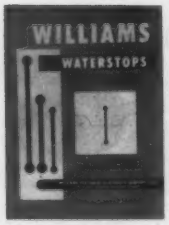
The consulting engineer's file folder contains literature describing the use of Nelson stud welding equipment for concrete anchoring devices and other structural fasteners. Includes data on welded stud fasteners, concrete fasteners, and powder actuated fasteners. Illustrated.

Nelson Stud Welding Division,
Gregory Industries, Inc.

555—Durable Colored Concrete Floors

Bulletin 9641 describes *Colorundum*, the integrally colored, durable, concrete floors. Bright, decorative, hard, abrasion resistant for indoors and outdoors. Come in 11 colors and are easy to maintain. Use, application, and specifications included. Color chart.

A. C. Horn Companies
Div. Sun Chemical Corp.



556—Efficiency Waterstops

Bulletin No. W-61 describes Williams efficiency waterstops for use in building and public works. Protects bridge and highway applications. Diagrams show application details. Also describes new molded union and junction fittings for use with Williams rubber and neoprene waterstops. Sales representatives listed.

Williams Seals & Gaskets Division.

557—Continuous Metal Ties Report

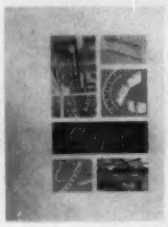
Armour Research Foundation of Illinois Institute of Technology summary report on "Investigation of Continuous Metal Ties as a Replacement For Brick Ties In Masonry Walls." Gives relative merits of the brick header course vs. continuous wire reinforcement in tying two wythes of a brick and block masonry wall.

Dur-O-waL.

558—Slope-Beams for Roofing

Catalog 4011 describes Inland's *Slope-beams*, used as the supporting member in a low profile building system. Specifications are given. Tables of load capacities and physical and structural properties. Gives design possibilities and costs. Illustrations show the versatility of *Slope-Beams*.

Inland Steel Products Co.



559—Cable Support Systems

Catalog 106 describes Chalfant cable support systems. Line drawing illustrates how system is installed. Method of fastening pictured. Complete specifications, design information, and dimensions for *Cabletrays*, *Cableracks*, *Cabletroughs*, and *Cabletruss*. Complete details are included on accessories and fittings.

Chalfant Products Co.

To order copies of the bulletins, please fill out the card between pages 2 and 3 or 58 and 59.

560—Wire Rope and Fittings

Bulletin A-893 is a convenient, pocket-size reference book that has proven invaluable to wire rope users. It contains comprehensive data on a wide range of Roebling wire rope constructions. Includes installation information and maintenance practices.

John A. Roebling's Sons Division
The Colorado Fuel and Iron Corp.

561—Steel Design Manual

First complete published manual containing design instruction for use of high strength steels. Includes fundamental characteristics, design considerations working unit stresses, tension, compression, shear, deformation and deflection, formed sections, and design against corrosion. Engineering, not sales manual.

U. S. Steel Corp.

562—Large Fasteners, Accessories

Bulletin 1260, an engineering guide for selecting large fasteners and construction accessories, lists complete specifications for threaded rods, clevises, turnbuckles, coupling nuts, and sleeve nuts. Guide also describes typical applications of special fasteners. Bolt diameters are 1¾ in. and up.

Jos. Dyson & Sons, Inc.

STRUCTURAL MATERIALS & EQUIPMENT *continued*

563—Wire Rope Catalog

A complete basic catalog for selecting wire rope for any use. Cross sections of different types of rope show construction. Rope diameters, breaking strength, and weight are given for all classifications. Well illustrated showing different uses. Wire rope fittings are illustrated.

American Steel & Wire Division, United States Steel Corp.

564—Cable, Wiring, Tubing Supports

Two systems of support for all types of cable, wiring, and tubing are described in a 28-page illustrated catalog. Systems are engineered to be used interchangeably, depending on the weight of the load to be supported at any location. *Globetray*, the ladder-type tray, and *Cable-strut*, the basket-type, described.

Globe Co.

565—Composite Building Construction

Bulletin describes composite construction. This is simply an improvement of the commonly used concrete slab and steel beam type construction. Gives history, advantages, compares new and old construction, records project saving 20 to 25 percent in structural steel.

Nelson Stud Welding Division, Gregory Industries, Inc.

566—Steel Joist Bridging

Technical Bulletin 1-BR is a report on the effect of various types of bridging on the behavior of open web steel joists, Shortspan or S-Series. Includes detailed results of three test series to determine amount of deflection and load transfer encountered with each type of bridging. Text is illustrated.

Steel Joist Institute.

567—Precast Concrete Elements

Catalog HMM 2180 graphically describes the unusual custom design possibilities of Marietta's complete line of precast and prestressed concrete building elements. Information on application for large or small all-concrete industrial and commercial buildings.

Marietta Concrete Division American-Marietta Co.

568—Reinforcing Steel

Four-page bulletin describes new Laclede high strength steel reinforcing bars for concrete. Bars conform to ASTM standards A15, A432 and A431. Chart shows stress-strain comparison. Tensile properties, physical properties, and allowable working stresses tabulated. Bars are marked to identify size and strength.

Laclede Steel Co.

569—Industrial Glassware

Bulletin 91 describes the wide range of *Vycor* brand glasses, which are suitable for applications beyond the range of any other commercially produced glasses except fused silica. Bulletin is printed in easy to read type with informative pictures, graphs and charts. Physical properties given.

Corning Glass Works.

570—Masonry Reinforcements

AA Wire Products Company, manufacturers of masonry reinforcement and masonry ties, announce that the all new 1961 Sweet's brochure is now available. This new brochure features design drawings, photographs of actual installations, and suggested guide specifications. Line drawings show various applications.

AA Wire Products Co.

571—Floor Grating

Bulletin covers an improved conception for the installation of floor gratings, using the single-span divider-bar, combined with Borden's Type K reversible grating. Simplifies maintenance as well as installation. Bulletin pictures and describes installation at the new Public Service Generating Station, Linden, N. J.

Borden Metal Products Co.

572—Pre-Engineered Steel Buildings

Bulletin 60-1-257 presents Stran-Steel's new concept in pre-engineered steel buildings combining the finest in design with mass production economies. Full color illustrations show Stran styles and typical interiors. The many colors available are shown in color chart. Special features are described and illustrated.

Stran-Steel Corp.

573—Steel Roof Systems

A completely new manual, Catalog 248 describes Inland's ten separate roof systems which offer the designer a choice of steel or poured construction. Included are comparision and selection charts, details, load tables, section properties, methods, specifications and other data on Inland roof systems.

Inland Steel Products Co.

574—Diesels for Shovels/Draglines

Bulletin 125 has complete technical data on White Superior's popular Model 40 engines, designed to give dependable power and top economy for heavy construction equipment. Engines come in 6 and 8 cylinder models and are rated from 385 to 800 bhp continuous.

White Diesel Engine Div., White Motor Co.

STRUCTURAL MATERIALS & EQUIPMENT *continued*

575—Aluminum Grating

New six-page illustrated bulletin describes the basic advantages of Gary super *Galok* aluminum grating. Outlines its industrial uses for stair treads and other uses, decorative and functional. Included are easy-to-use tables of safe loads and weights, panel widths, types.

Rockwell-Standard Corp., Grating Division.

576—Cable and Tubing Support System

Chalfant Support system utilized for carrying instrumentation tubing, process tubing, piping, and control cables. Recommended for more economical, and faster installation over previous type systems. Completely pre-engineered and available with all accessories. Aluminum, galvanized steel and aluminized steel.

Chalfant Products Co.

577—Silicone Water Repellent

Bulletin 1597 describes new and improved *Dehydratine®* No. 22 silicone water repellent for masonry surfaces. Tells what it is, what it does, and how it is applied. Also covers its advantages in controlling efflorescence, repelling water, and minimizing painting.

A. C. Horn Companies Div. Sun Chemical Corp.

578—Prestressed Concrete Members

The rapid growth in the use of precast pretensioned bonded prestressed concrete members confirms their several advantages over competitive materials. Bulletin PC-945 describes application and productions, and covers buildings, bridges, piles, casting bed details, and tensioning data. Fully illustrated.

John A. Roebling's Sons Division.

579—Complete Structural Systems

Catalog describes Flintkote's *Insulrock* roof decks. Lists the advantages in its use. Gives design data, specifications, and erection procedures with detailed drawings on joist and beam construction and sub-purlin construction. Also gives data on roof deck formboard and formboard for concrete construction.

Flintkote Co., Insulrock Division.

580—Aluminum Windows

Catalog A-62 describes the complete line of Bayley aluminum windows, including original Bayley features. The booklet includes such items as projected windows, pivoted windows, class room windows, ribbon windows, and detention windows. Dimensions, construction, design, fasteners, materials, and finish.

William Bayley Co.

581—Floor Deck

Catalog 272 describes Inland Steel's new *Hi-Bond* floor deck, offering concrete reinforcing without bars. Tables of section properties and allowable superimposed loads. Complete construction details are included. Suggested engineers specifications include scope, material, design, and erection. Sales locations.

Inland Steel Products Co.

582—Color for Metal Buildings

Booklet, combining artistic and photographic treatment, graphically portrays revolutionary *Butler-Tone* color system for pre-engineered metal buildings. Text and illustrations provide reader with "inside look" at unique panel coating operation. Chart of available colors included. Installation pictured in color.

Butler Manufacturing Co.

To order copies of the bulletins, please fill out the card between pages 2 and 3 or 58 and 59.

583—Pressure Grouting Services

Brochure PGS-0002 describes Halliburton Pressure Grouting Services, including equipment, personnel, and materials for any size grouting job — a dependable and convenient method of metering, mixing, placing grouting materials continuously. Selection of special chemical grouting fluids and cement grout slurries.

Halliburton Co.

584—Water and Acid Proof Sealer

Bulletin describes Sauereisen No. 44, a ready-to-use plastic sealer for acids, alkalies, caulking, floors, sumps, and tanks. Includes the many advantages, industrial uses, and complete specifications. Application procedures with trowel, putty knife, or caulking gun are outlined. Will withstand shock and rough usage.

Sauereisen Cements Co.

585—Steel Base for Concrete Floors

Bulletin BFg-604 describes Granco Steel's *Corruform* and *Tufcor*, steel base for concrete floors. Line drawings show construction. Installation steps are pictured. Selection tables for safe superimposed loads, maximum allowable loads, pipe tunnels, and physical properties. Typical specifications and details are included.

Granco Steel Products Co.

STRUCTURAL MATERIALS & EQUIPMENT *continued*

586—Control Joints and Gaskets

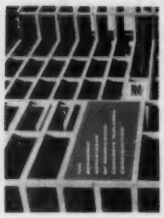
This 24 page manual covers long and short form master specifications. Shows installation methods for control joints and gaskets, expansion gaskets, waterstops, panel seals, and sound deadener strips used in all construction. Includes bulletins SG-61 and W-61. Construction details for all seals included.

Williams Seals & Gaskets Division

587—Pre-Engineered Metal Buildings

Booklet, packed with pictures of government building projects, details advantages of pre-engineered metal building concept. Striking photographs cover variety of building end-uses on federal, state, local levels of government. Includes offices, laboratories, warehouses, recreation halls, hangars, bowling lanes.

Butler Manufacturing Co.



588—Concrete Building Construction

Brochure entitled "The Economic Advantages of Reinforced Concrete Building Construction" is offered by the Concrete Reinforcing Steel Institute. Actual figures on two housing projects show lower construction costs. Application photographs show structural beauty, and design flexibility.

Concrete Reinforcing Steel Institute.

589—Long Span M-Decks

Catalog LSD-61 describes Mahon's long span M-Decks which provide complete structural roof and combined roof-ceiling. Structural members, deck, and ceiling in one unit. Cutaways show construction. Contains sound absorption tables, section property tables, and load tables. Specifications and construction details.

R. C. Mahon Co.

590—Glass Protected Smokestacks

Bulletin SS-210 describes A. O. Smith's glass coated smokestacks, toughest protection against corrosion. Graphs show comparison of costs against unlined stacks over period of years. Complete specifications. Tables of sizes and shipping weights. Assembly details. Diagrams show special sections.

A. O. Smith Corp.

591—Fly Ash Hopper Liner Grid

Brochure containing illustrations, drawings, data, and description of how the life of cement linings in fly ash hoppers, induced draft fans, cat crackers, reactors, and the like can now be lengthened by "Gridsteel". Installation procedure outlined. Photographs show many varied applications.

Irving Subway Grating Co., Inc.

592—Heavy-Weld Steel Grating

New 8 page catalog H760 has a unique series of charts for use in determining the exact size and type of *Heavy-Weld* grating suitable for your particular application. Handy tables simplify the problem of specifying exactly the right grating for every load requirement.

Rockwell-Standard Corp., Grating Division.

593—Safe, Slip-Proof Surfaces

This bulletin describes the use of fused aluminum oxide and silicon carbide in the preparation of anti-slip surfaces on concrete floors, steps, sidewalks, concourses, and bridges. Included are methods of application. These anti-slip abrasives can also be used with epoxy resins to cover existing surfaces.

Exolon Co.

594—Self-Lubricating Bushing Manual

Manual 56 gives complete information, technical data, and specifications on *Lubrite* self-lubricating bushings, bearings, and washers for industrial equipment, hydro-electric, high temperature missile, and atomic applications. Design specifications include loads and speeds, data on alloys, and clearance tables.

Merriman Bros., Inc., Lubrite Division.

595—Steel Buildings

Bulletin 12360 describes various types and sizes of Armco pre-engineered steel buildings. Specifications for truss-type, rigid frame, self-framing, and single slope roof, include roof pitch, structural system, column spacing, wall covering, roof covering, and foundation. Drawings show close detail, and elevation.

Armco Drainage & Metal Products, Inc.

596—Steel Stair Treads

Tread-Grip steel stair treads combine strength of construction with safe, nonslip footing, according to four-page bulletin HTP2130. This brochure describes such features as *A. W. Algrip* nosing, electroforged and welded construction, and twisted cross bars. Included are detail drawings and dimensions.

Horace T. Potts Co.

597—Soil Compaction

Foundations on sand are described in booklet "Soil Compaction by Vibroflotation". Contents cover application and operation, soil consolidation examples, data on specifications, excavations and test pits. Detailed drawings show *Vibroflot* machine in operation and typical compaction pattern for required density.

Vibroflotation Foundation Co.

WASTE DISPOSAL EQUIPMENT

598—Sewage Treatment

Bulletin 7318 describes the Dorr-Oliver Inka Aeration System, a unique system for the aeration of activated sludge. Low pressure fans supply air through aeration grids located in the upper portion of the aeration tank. Complete description and typical installations are presented. Cutaways, dimensions included.

Dorr-Oliver Inc.

599—Surface Aerators

Bulletin 6620-A describes Infilco's new *Vortair*, a mechanical type of surface aerator. Discusses oxygen input efficiency and power savings. Gives complete specifications and installation dimensions for 15 models in tabular form. Applications are outlined. Photographs show installations and operation.

Infilco Inc.

600—Comminutor Selection Handbook

Bulletin 2129-B1 is a selection and application handbook of comminutors for sewage and industrial waste treatment. Shows sectional elevations. Gives factors to consider for comminutor selection in the modern sewage or industrial plant. Line drawings show how comminutor works. Typical channel designs shown.

Worthington Corp.

601—Double-Deal Time Switch

Provides automatic control in Sewage Disposal systems or for any application requiring accurate operations in minutes at specific times of day or week. Up to 7 different repeating cycles possible. Switching can occur every hour or every 2, 3, 4, 6, 8, 12, or 24 hours, or with any combination of cycles. Bulletin 77.

Tork Time Controls, Inc.

602—Rubberized Sewer Pipe Joints

A 16-page technical manual in color fully describes, illustrates, and diagrams the full line of *Tylox*® rubber and neoprene gaskets for coupling any type of concrete sewer pipe. *Tylox*® physical properties, guides for writing rubber joint specifications, and tips on *Tylox*®-jointed pipe installation are also included.

Hamilton Kent Manufacturing Co.

603—High-Flow-Rate Clarifiers

Bulletin CL-158 describes the *Illco-Way* continuous high-flow-rate clarifier, an upflow coagulator design that is adaptable to a wide variety of water and waste treatment applications, including lime-soda dealkalization, removal of iron, color, turbidity, organics, silica, and chemical waste treatment.

Illinois Water Treatment Co.

604—Packaged Sewage Pump Stations

A new 8-page bulletin contains a descriptive and well illustrated story of the *Tex-Quad* rectangular-shaped packaged pump station. Operating features, design improvements, dimensional drawings, and a list of variable capacity pump benefits are incorporated in the brochure. The company's other products are listed.

Tex-Vit Manufacturing Co.

605—Municipal Engines

Bulletin SA-631 describes Climax engines which provide low cost, dependable power for sewage and water treatment plants. Engine specifications for various models are given in tabular form. Photographs of models are accompanied by power curve graphs. Standard equipment and optional equipment.

Climax Engine Mfg. Co.

606—Adjustable Speed Sewage Pump

Bulletin 4400-PRD-270, describing adjustable speed sewage pumping using the *Ampli-Speed* Magnetic Drive, has been made available by Electric Machinery Mfg. Co. Explains how a magnetic drive works, the economics of adjustable speed pumping, consulting engineer's role in sewage construction.

Electric Machinery Mfg. Co.

607—Treatment Tanks

Bulletin AET-59 contains full-color illustrations of water and effluent treatment tanks. They are steel-reinforced concrete structures faced on both sides with vitrified tile, laid with corrosion-resistant mortar. Tanks are exceptionally attractive in appearance. Included are drawings showing wall construction.

Stebbins Engineering & Mfg. Co.

608—Aerators

Bulletin 5917 describes General Filter aerators for the oxidizing of iron and removal of gases from water. The process of aeration is explained. Four types of aerators are listed with data given. Pictures of actual installations of various sizes and locations are featured. Complete specifications.

General Filter Co.

609—Sewage Treatment Plants

Bulletin 19-S-94 describes Walker's new *Sparjair* process utilizing contact stabilization and aerobic wet burning. Operation fully described, accompanied by diagram showing arrangement of components. Complete detail drawings show *Sparjair* plants. Complete specifications in tables. Engineers' specification form.

Walker Process Equipment Inc.

WASTE DISPOSAL EQUIPMENT *continued*

610—Sewage Lift Stations

Bulletin EJ-60 describes the *Ellipto-Ject* packaged pneumatic sewage lift station manufactured by Tex-Vit Manufacturing Company. A simplex unit available in 20 to 200 gpm, it features exclusive shell-within-shell design. Bulletin provides engineering data, specifications, and dimensional drawings.

Tex-Vit Manufacturing Co.

611—Sewage Treatment Plant

Bulletin 7315 describes the Dorr-Oliver *CompleTreator*. Low maintainance components add up to minimum operating costs. The same efficient treatment accomplished in hundreds of large plants using the *Biofiltration* process can be had for small housing developments, restaurants, schools, military installations.

Dorr-Oliver Inc.

To order copies of the bulletins, please fill out the card between pages 2 and 3 or 58 and 59.

612—Digester Circulator-Mixer

Bulletin 25-S-91 describes Walker's new *Gaslifter* unit. The operation of this digester circulator-mixer is fully explained. Large drawing shows construction and direction of flow. Sample form for use by the engineer in specifying is detailed. Typical installations are illustrated. Other Walker products listed.

Walker Process Equipment Inc.

WATER TREATMENT EQUIPMENT

613—Levoltrol System

Bulletin B659P describes a system for wet storage brinemaking which proportionately replaces water as brine is withdrawn. Permits accurate salt inventory; prevents overflow loss; eliminates corrosion of moving parts. Line drawings show different types of assemblies for different brine-use systems.

Morton Salt Co.

616—Water Clarification, Softening

Bulletin WC-103-C describes the Graver reactivator, a high flow rate water treating unit which produces the highest quality in minimum time. Cutaway shows and names components. You are taken step by step through the operation and given the result of each step. Flow diagrams, installation, and accessories.

Graver Water Conditioning Co.

614—Water Treatment Equipment

Bulletin 615 is a booklet on water treating equipment describing manual and automatic zeolite softeners, mixed-bed and multi-column deionizers, dealkalizers, ion exchangers, filters, purifiers, aerators, and degasitors. Also covers spray and tray type deaerating heaters and water treating chemicals.

Elgin Softener Corp.

617—Packaged Demineralizers

Bulletin 4721 describes Permutit packaged demineralizers, factory-assembled systems ready to connect and operate. Contains detailed information on mixed-bed, two-step, and non-regenerable demineralizers. Special skid mounted units, completely packaged and shipped as finished units. Models illustrated.

Pfaudler Permutit Co.

615—Complete Water Services

Bulletin 10 outlines the complete water services offered by Layne & Bowler. Gives general facts and pertinent information on water well systems, drilling, and allied water services. Included are data on equipment for municipalities, industry, and agriculture. Lists pumps for every application. Associates listed.

Layne & Bowler, Inc.

618—Better Water

Bulletin No. 6106 is a new general information bulletin about General Filter Company. A picture listing of current equipment is featured. Equipment offered includes filters, softeners, clarifiers, aerators, controls, and others. Map shows locations of sales offices. Complete General Filter program is given.

General Filter Co.

WATER TREATMENT EQUIPMENT *continued*

619—Cartridge De-Ionizers

Operating on the same principle as large mixed-bed de-ionizers used in power plants and for process water supplies, these cartridge de-ionizers are designed to furnish small quantities of purified water for laboratories and pilot plant applications. Cartridges and installations illustrated. Prices are included.

Illinois Water Treatment Co.

620—Water Works Brass Goods

The water works brass goods bulletin W-500 illustrates and describes McDonald water service products. Included are curb stops, corporation stops, goosenecks, meter stops and couplings, service pipe couplings, and extension service boxes. Each product offered is pictured with description and specifications.

A. Y. McDonald Mfg. Co.

621—Brinemakers

Bulletin B160A describes Morton's Model E Series brinemakers using the exclusive Morton *Fluitron*. Function, performance data, installation procedures, and operating instructions are included in this bulletin. Line drawing shows construction and operation. Component parts shown and named. Product photographs.

Morton Salt Co.

622—Spray-Type Deaerating Heaters

Bulletin WC-101C describes the Graver spray deaerating heater, engineered to individual requirements. Includes text on principles of deaeration, spray heater operation, design features, and accessory equipment. Types of standard designs are shown with application data. Cutaway shows operation.

Graver Water Conditioning Co.

623—Ion Exchange

Technical bulletin explains principles and chemical reactions of ion exchange in simple, understandable terms. Describes and shows flow-diagrams of eight typical multi-column deionizers. Gives details about mixed-bed type Ultra-De-Ionizer giving water of highest chemical purity. Deionizer selection chart.

Elgin Softener Corporation.

624—Underdrain Systems

Bulletin 4831 describes Permutit's new *Unimedia* underdrain system for concrete gravity filters or softeners. Available in two styles, header-lateral and false-bottom design. Components are preassembled prior to shipment, minimizing labor of installation. Details show construction and arrangements.

Permutit Co., Div. Pfaudler Permutit, Inc.

625—Cooling System Pretreatment

Bulletin C4 describes *Nalprep* pre-treatment, a new concept in protecting cooling systems against corrosion. Photographs of actual plant equipment document effectiveness of *Nalprep*. It simultaneously prepares metal surfaces to accept inhibitor and applies a protective film. Outlines application methods.

Nalco Chemical Co.

626—Coagulants, Coagulation Aids

Advances in chemistry of coagulation applied to modern water treatment in municipal and industrial plants, problems and solutions are discussed in bulletin A1. Application of sodium aluminates, refined montmorillonite, organic polymers, and a new concept of *Inline Clarification*, are described. Other data.

Nalco Chemical Co.

INDEX

AA Wire Products Co. 552, 570
ACF Industries, Inc., W-K-M Div. 435
Acme Industries, Inc. 24, 40
Advance Transformer Co. 320, 333
Aerovent Fan Co., Inc. 207, 507
Aget Mfg. Co. 2, 13
Air Moving & Conditioning Ass'n Inc. 224, 235
Allen-Bradley Co. 88, 131
Allis-Chalmers 101, 111, 126, 135, 150, 539
Altec-Lansing Corp. 67, 78
American Air Filter Co., Inc. 7, 8, 9, 10, 31, 212
American Chain & Cable Co., R-P & C Valve Div. 409, 457
American Gilsonite Co. 304, 308
American Hoist & Derrick Co. 366, 378
American Machine and Metals, Inc., DeBothezat Fans Div. 201, 223
American-Standard, Industrial Div. 11
American Vitrified Products Co. 403, 451
Anaconda Wire & Cable Co. 193
Appleton Electric Co. 314, 356
Armco Drainage & Metal Products, Inc. 242, 595
Armstrong Cork Co. 48, 59, 305
Armstrong Machine Works 400, 450
Arrow-Hart & Hegeman Electric Co. 93, 141
Aurora Pump Division 518, 543
Autocall Co. 190, 191
Automatic Switch Co. 106, 157, 272, 293
Barber-Colman Co. 21, 37, 44, 274
Barber-Greene Co. 358, 374
Barco Mfg. Co. 260, 439
Barkelew Electric Mfg. Co. 164
Bayley Co., Wm. 55, 580
Beaird Co., Inc., J. B. 482, 497
Bell & Gossett Co. 195, 527
Benjamin Div., Thomas Industries 317, 330
Bilco Co. 47, 58
Black, Sivalls & Bryson, Inc. 441, 506
Blonder-Tongue Laboratories, Inc. 75, 76
Bohn Aluminum & Brass Corp. 20, 36
Borden Metal Products Co. 553, 571
Bruning Co. Inc., Chas. 181, 182
Buchanan Electrical Products Corp. 91, 147
Buell Engineering Co., Inc. 3, 16
Buensod-Stacey, Inc. 22, 38
Buffalo Forge Co. 34, 209
BullDog Electric Products Div. 166, 351
Burgess-Manning Co. 476, 499
Bussmann Mfg. Div., McGraw-Edison Co. 95, 127, 140
Butler Mfg. Co. 582, 587
Byron Jackson Pumps, Inc. 520, 540
Carrier Air Conditioning Co. 25, 43
Caterpillar Tractor Co. 473, 489
Chalfant Products Co., Inc. 559, 576
Chapman Valve Mfg. Co. 413, 458
Chrysler Corp. Airtemp Div. 23, 39
Clarage Fan Co. 200, 227
Clay Sewer Pipe Assoc., Inc. 401, 445
Cleaver-Brooks Co. 479, 490
Climax Engine Mfg. Co. Div. of Waukesha Motor Co. 492, 605
Clyde Iron Works, Inc. 360, 363
Cochrane Div., Crane Co. 481, 491
Colorado Department of Development 467
Columbus McKinnon Corp. 362, 372, 379
Combustion Engineering, Inc. 469, 488
Committee of Steel Pipe Producers 215, 437
Conco Engineering Works 365
Concrete Reinforcing Steel Institute 175, 588

INDEX

Concrete Thermal Casings, Inc. 219, 234
Condenser Service & Engrg. Co., Inc. 194, 388
Connor Engineering Corp. 1, 15, 211, 425
Continental Equipment Co. 414
Cope, T. J., Div. of Rome Cable Corp. .. 83, 132
Corning Glass Works 551, 569
Crane Co. 399, 444, 474, 494
Crouse-Hinds Co. 122, 343
Curtis-Allbrite Lighting, Inc. 318, 336

Day-Brite Lighting, Inc. 334, 345
Dean Products, Inc. 45, 256
DeBothezat Fan Division,
American Machine and Metals, Inc. .. 201, 223
Denver Equipment Co. 258, 532
Detroit Stoker Co. 478, 500
Dorr-Oliver Inc. 598, 611
Dow Chemical Co. 311, 424
Dow Corning Corp. 167, 310
Dracco Div. of Fuller Co. 12, 369
DuKane Corp. 68, 73
Dunham-Bush, Inc. 19, 35, 46, 208
Dur-O-wal Products, Inc. 545, 557
Dwyer Mfg. Co., F. W. 273, 289
Dyson & Sons, Inc., Joseph 546, 562

Eagle Electric Mfg. Co., Inc. 110, 155
Edwards Co., Inc. 66, 74
Edison Industries, Thomas A. 267, 291
Electric Cord Co. 348, 353
Electric Machinery Mfg. Co. 121, 606
Electric Storage Battery Co., Exide Div. 177, 375
Elgin Softener Corp. 614, 623
Everlasting Valve Co. 396, 446
Exolon Co. 250, 593

Fairbanks Co. 407, 460
Fairbanks, Morse & Co. 523, 531
Fisher Governor Co. 277
Flintkote Co., Insulrock Division 54, 579
Foster Co., Benjamin 302, 306
Foster Wheeler Corp. 480, 495
Fuller Co. 380, 381

Gamewell Co. 187, 275
General Cable Corp. 107, 152
General Electric Co. 92, 104, 105, 119, 137, 145,
153, 172, 283, 323, 328, 342, 429
General Filter Co. 608, 618
General Time Corp., Stromberg Div. 61, 72
Globe Co. 550, 564
Golden-Anderson Valve Specialty Co. .. 398, 454
Granco Steel Products Co. 249, 585
Grand Hotel 390, 392
Graver Tank & Mfg. Co. 367, 382
Graver Water Conditioning Co. 616, 622
Greenheck Fan & Ventilator Corp. 203, 228
Gregory Industries, Inc.
Nelson Stud Welding Div. 554, 565
Grover Co., Powers Regulator Co. 359, 376
Guth Co., Edwin F. 335, 350

Halliburton Co. 276, 583
Hamilton Kent Mfg. Co. 313, 602
Hardinge Co., Inc. 254, 262
Haughton Elevator Co. 368
Haws Drinking Faucet Co. 393, 443
Heinemann Electric Co. 81, 130
Hersey-Sparling Meter Co. 301
Hevi-Duty Electric Co. 103, 144
Horn Companies, A. C. 555, 577
Hydrotherm, Inc. 205, 230

Ideal Electric & Mfg. Co. 84, 133
Illinois Water Treatment Co. 603, 619
Industrial Combustion, Inc. 477, 498
Infilco, Inc. 297, 599
Inland Steel Products Co.
..... 49, 60, 173, 558, 573, 581
International Boiler Works Co. 472, 493
International Business Machines Corp. .. 184, 185
Irving Subway Grating Co., Inc. 251, 591
I-T-E Circuit Breaker Co.
..... 90, 100, 108, 117, 138, 143, 162, 170, 178

Johnson Co., S. T. 196, 508
Johnson Gear & Mfg. Co. 386, 387
Johnson Service Co. 32, 427
Johnston Pump Co. 513, 530

Kearney Corp., James R. 96, 180
Keasbey & Mattison Co. 53, 192
Kellogg Co., M. W. 433
Kemlite Corp. 57
Kennedy Valve Mfg. Co. 416, 464
Kerite Co. 123
Kerrigan Iron Works Co. 247, 252
Killark Electric Mfg. Co. 89, 148
King Engineering Corp. 298, 509
Kinnear Mfg. Co. 50, 51
Kohler Co. 419, 510
Koppers Co., Inc. 26, 42
Kraloy/Chemtrol Co. 163, 426

Laclede Steel Co. 568
Layne & Bowler, Inc. 188, 615
Layne & Bowler Pump Co. 515, 529, 535
Lehigh Fan & Blower Div. Fuller Co. 226, 505
Leupold & Stevens Instruments, Inc. 279, 295
Leviton Mfg. Co., Inc. 109, 154
Lightolier Inc. 329, 354
LimiTorque Corp.
Philadelphia Gear Works, Inc. 385, 428
Liquidometer Corp. 266, 290
Litecraft Mfg. Corp. 319, 338
Lovejoy Flexible Coupling Co. 383, 384

McAlear Mfg. Co. 395, 449
McDonald Mfg. Co., A. Y. 442, 620
mcPhilben Lighting Co. 248, 344
Magnetrol, Inc. 264, 284
Mahon Co., R. C. 255, 589
Marietta Concrete Div.,
American-Marietta Co. 371, 567
Marlo Coil Co. 28, 214
Marsh Instrument Co. 271, 292
Marvin Electric Mfg. Co. 179
Mears Controls, Inc. 129, 296
Mercoid Corp. 174, 422
Merriman Bros., Inc., Lubrite Div. 245, 594
Miller Co. 347
Minneapolis-Honeywell Regulator Co. ... 41, 299
Mission Valve & Pump Co. 436
Moloney Electric Co. 116, 156
Morton Salt Co. 613, 621
Mueller Co. 394, 448
Murray Mfg. Co., D. J. 206, 511

Nalco Chemical Co. 625, 626
Naylor Pipe Co. 402, 455
Nesbitt, Inc., John J. 202, 229
Niagara Blower Co. 30, 485
Niagara Mohawk Power Corp. 465, 466
Nibco, Inc. 263, 418
Nugent & Co., Inc., Wm. W. 430

Onan Div., Studebaker-Packard Corp. ... 87, 142
Orangeburg Mfg. Co.,
Div. of Flintkote Co. 165, 440
Orr & Sembower 483, 501
O. Z. Electrical Mfg. Co. 99, 149

Pacific Pumping Co. 517, 541
Panellit, A Div. of ISI, Inc. 269, 287
Pass & Seymour, Inc. 114, 160
Penn Ventilator Co., Inc. 217, 225
Pfaff & Kendall 241, 253
Pfaudler Permutit, Inc. 617, 624
Philadelphia Gear Works, Inc.
LimiTorque Corp. 385, 428
Pick Motels & Hotels, Albert 389, 391
Piqua Machine & Mfg. Co. 526
Planet Corp. 243, 373
Platecoil Div., Tranter Mfg., Inc. 197, 198
Pleuger Pump Mfg. Co. 512, 544
Portland Cement Association 238, 240
Powell Co., Wm. 411, 456
Powers-Mosler Division,
Powers Regulator Co. 65, 79
Powers Regulator Co. 70, 281
Pratt Co., Henry 431, 438
Pringle Electrical Mfg. Co. 82, 136

Radio Corporation of America 64, 69, 71
Rauland-Borg Co. 62, 77
Recordak Corp. 183, 186
Reliance Gauge Column Co. 270, 288
Ric-wil Inc. 420
Robbins & Myers, Inc. 220, 233
Robinson Clay Products Co. 408, 462

Rockwell-Standard Corp., Grating Div. .. 575, 592
Roebling's Sons Div., John A.
Colorado Fuel & Iron Corp. 239, 246, 560, 578
Rome Cable Division of Alcoa 128, 309
Roper Hydraulics, Inc. 521, 537

S & C Electric Co. 115, 161
Sauereisen Cements Co. 312, 584
Scam Instrument Corp. 265, 286
Schaub Engineering Co., Fred H. 484, 504
Simplex Wire & Cable Co. 120
Skidmore Corp. 519, 536
Slater Electric & Mfg. Inc. 118, 349
Smith Corp., A. O. 261, 590
Smoot-Holman Co. 327, 341
Sola Electric Co. 326, 339
Solar Aircraft Co. 502, 538
Sorgel Electric Co. 98, 125, 159
Southern Pipe Div. U. S. Industries, Inc. 405, 463
Speedline Fittings Div.
Horace T. Potts Co. 421, 596
Square D Co. 86, 102, 112, 113, 124, 146
Standard Electric Time Co. 158, 282
Stebbins Engineering & Mfg. Co. 364, 607
Steel Joist Institute 566
Stephens-Adamson Mfg. Co. 357, 370
Stran-Steel Corp. 56, 548, 572
Stromberg-Carlson, General Dynamics ... 63, 80
Stromberg, Div. of General Time Corp. .. 61, 72
Strong 406, 459
Sumo Pumps, Inc. 522, 542
Sunbeam Lighting Co. 322, 355
Sun Chemical Corp. 555, 577
Superior Combustion Industries, Inc. ... 475, 496
Surface Combustion,
A Div. of Midland-Ross Corp. 18, 259
Sutorbilt Corp. 514, 534
Sylvania Electric Products, Inc. 324, 331
System Analyzer Corp.,
Add-A-Phase Div. 97, 151

Tapecoat Co. 303, 307
Taylor Co., Halsey W. 434
Temprite Products Corp. 447
Tex-Vit Manufacturing Co. 604, 610
Thompson Electric Co. 321, 346
Tinker & Rasor 278, 294
Titus Mfg. Corp. 204, 237
Torit Manufacturing Co. 5, 14
Tork Time Controls, Inc. 415, 601
Trerice Co., H. O. 300, 432
Tube Turns Plastics, Inc. 404, 452

Union Carbide Development Co. 4, 17
United Sheet Metal Co., Inc. 213, 257
U. S. Electrical Motors, Inc. 168, 280
U. S. Steel Corp. 547, 549, 561, 563

Vibroflotation Foundation Co. 597
Viking Pump Co. 516, 525
Vogt Machine Co., Henry 29, 199

Wagner Electric Corp. 94, 134
Wakefield Co. 325, 332
Walker Process Equipment, Inc. 609, 612
Water Saver Faucet Co. 171, 423
Waukesha Motor Co. 470
Webster Engineering Co. 210, 503
Weighing & Controls, Inc. 268, 285
Weil-McLain Co. 222, 231
Weinman Pump Mfg. Co. 524, 533
Western Engineering & Mfg. Co. 221, 232
Westinghouse Electric Corp. 6, 85, 139, 218, 236,
244, 315, 316, 337, 340, 352
Wheeling Corrugating Co. 33, 52
White Diesel Engine Div.
White Motor Co. 528, 574
Whiting Corp. 361, 377
Wickes Boiler Co. 471, 487
Williams Equipment & Supply Co. 556, 586
W-K-M Div. of ACF Industries, Inc. 435
Wood Co., R. D. 189, 410
Worthington Corp. 468, 486, 600

Yarnall-Waring Co. 412, 461
York Corp., Borg-Warner Corp. 27, 216
Youngstown Sheet & Tube Co. 176, 397, 417, 453

Zenith Electric Co. 169